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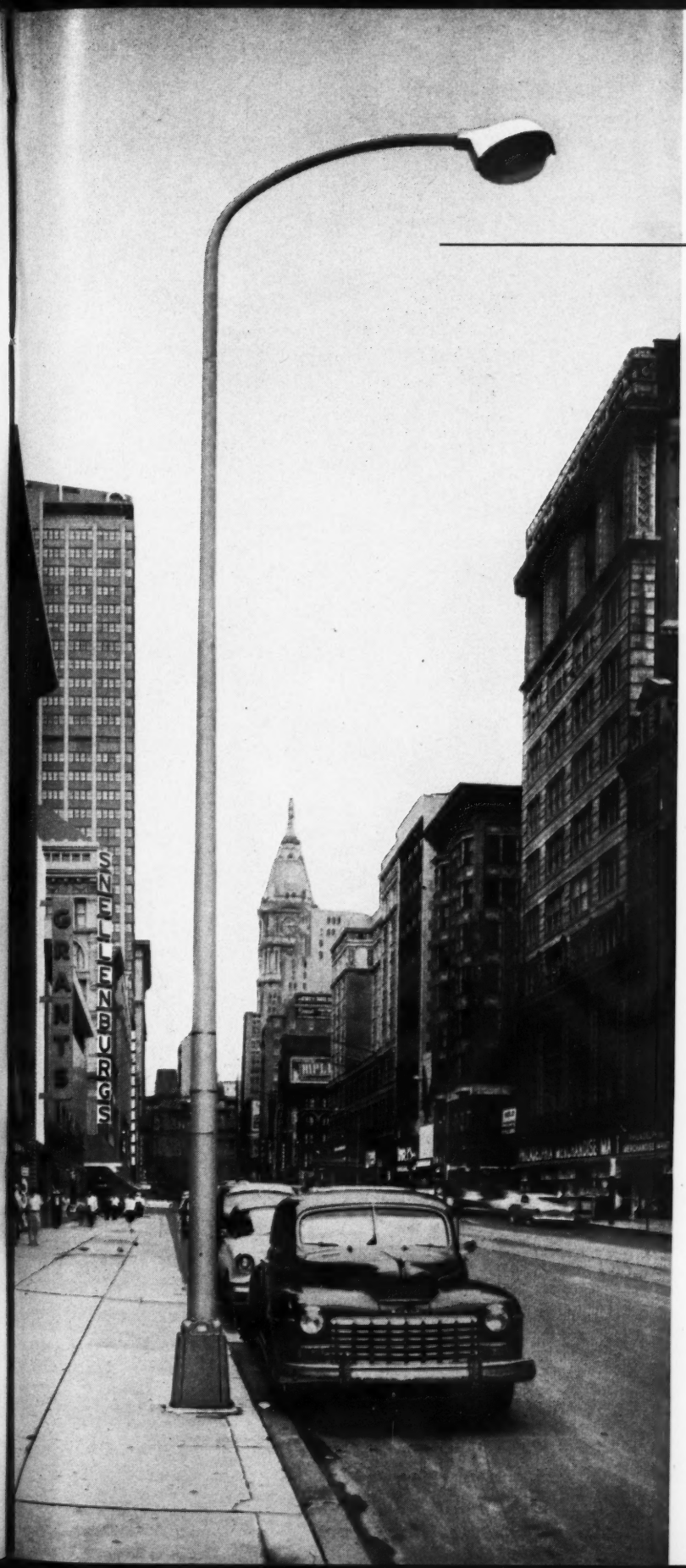

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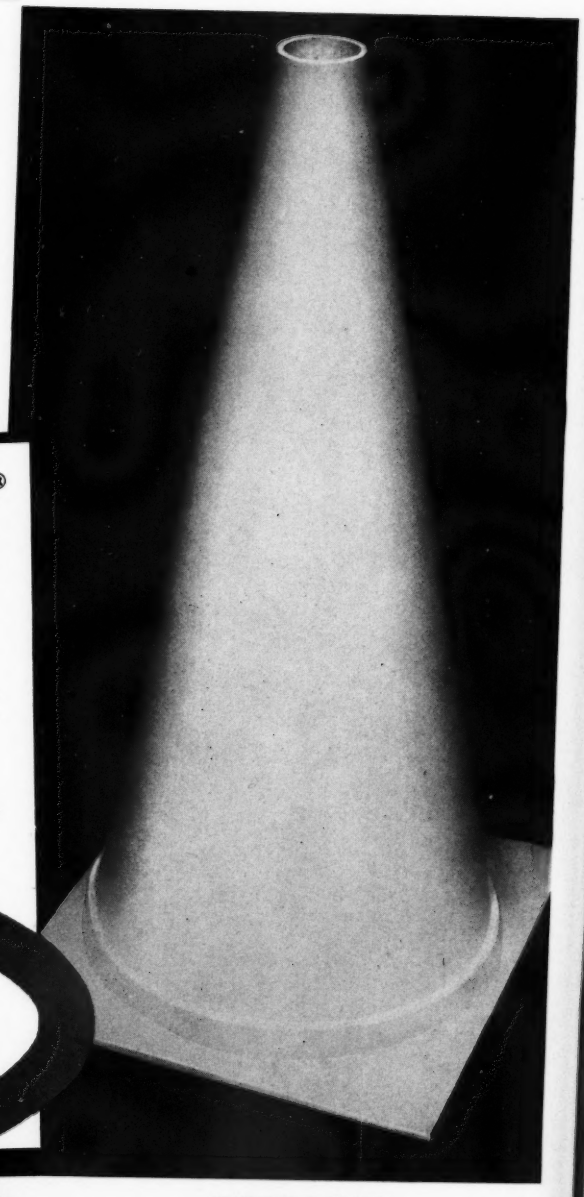

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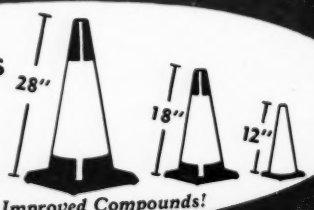

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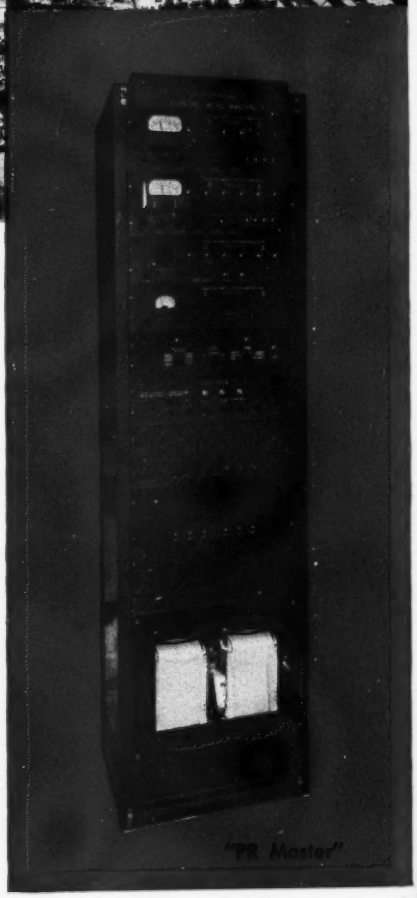

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Frankly Speaking . . .

THE GREATEST DILEMMA facing a conscientious practicing traffic engineer is the problem of how much time to devote to each of the equally important jobs facing him each day.

It is a poorly organized man that devotes all his efforts to solving day to day routine problems; it is a foolish man who ignores these "emergencies" and devotes all his time to long range planning; and it is a well organized traffic engineer who can handle emergencies well and can also keep moving forward on his long range plans.

A traffic engineer's duties range from those which immediately and directly affect a few persons to those which are tremendous engineering projects affecting all people and are slow of accomplishment.

We tell ourselves that as professional people we must be scientific, we must have warrants, we must apply the rules of 85 per cent; but we can't avoid the fact that we are in a business that is political; it is a business that produces more ideas based on instantaneous personal experiences by the general public than any other; and it is a business that is dependent more than any other on the good will of politicians and public alike.

No man in responsible charge has the time to handle all problems with complete thoroughness and speed. The traffic engineer is harassed by problems that would drive an ordinary executive to distraction but he must handle each delicate situation to the satisfaction of individuals, the public in general and the politician.

This proper balancing of the very important duties of a traffic engineer requires a sympathetic handling of the mother's request for crosswalks which she feels are necessary for her children's safety along with intelligent progress on plans for the needed major highways.

A mother asking for crosswalks cannot be placated by telling her that an expressway to be completed 5 years hence will remove heavy traffic from her street and a chamber of commerce will not excuse a delay in major work because "emergency" jobs take all our time.

To fulfill our responsibilities we must become more efficient, we must program our time, we must develop greater awareness of the need of good political and public relationship and above all we must develop our visionary powers. While we are issuing orders to paint crosswalks for Mrs. Jones we must be working toward a plan so that her children's children will not be endangered by heavy traffic.

If I were asked to weight the two extremes of traffic engineering responsibility facing our administrative traffic engineer I would have to place the handling of routine complaints a little farther up the scale. This work is a foundation to all that we do. It is the immediate good will of public and politician alike that controls the size of our budget for our planning work. To do many of our major jobs we must maintain an atmosphere of public understanding. The mother asking for a crosswalk may not ever again contact the city hall and her opinion of us is formed by the way we handle that one small item.

There is no other profession that requires so great an ability in administration, so much human understanding and such farsightedness in planning as does traffic engineering. Many of us do not recognize these facts and at year's end are faced with loss of our hoped-for budget increases and a steadily more difficult public relations situation.

W. R. MARSTON, *Director, District 4*
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A Mechanical Method for Assigning Traffic to Expressways

By E. Wilson Campbell
(Assoc. Mem., ITE)
Chief Traffic Engineer
Chicago Area Transportation Study

This paper was winner of an Honorable Mention in the 1957 Past Presidents' Award competition of the Institute of Traffic Engineers. It was also presented in somewhat more detail at the Annual Meeting of the Highway Research Board in January, 1956.

INTRODUCTION

One of the most important uses of traffic assignment is in testing new route proposals for their ability to serve the traffic needs of an area. Traffic assignment can provide a very reasonable estimate of the demand for use of new route proposals. Locations where impossible overloads might develop or where traffic loads are not sufficient to justify expressway or freeway type construction become immediately apparent when traffic loads are assigned to the planned facilities.

Ideally a plan should be based on the traffic pattern developed from origin and destination information. After the plan is carefully worked out it should be subjected to test by traffic assignment. This test might indicate that some rearrangement of routes is necessary or that new routes should be added or perhaps others dropped from the plan. Based on this test the plan should be revised and then tested again by assignment. This process should be continued within the limits of time until a suitable plan is devised.

This process of testing and revising is highly desirable but has not been possible due to the amount of time required to complete an assignment. Each zonal transfer must have a route via expressways compared to an alternate route from origin to destination. This involves measuring and recording a huge amount of data and is tedious and time consuming. The Staff of the Detroit Study was faced with the problem of assigning 23,500 non-directional trip transfers (actually over 47,000 zone to zone transfers) to more than 350 miles of proposed new express routes in the Detroit area. The time allotted was six weeks. An assignment involving a manual inspection of each zone to zone movement was out of the question. It quickly became apparent that a technique utilizing rapid data processing and calculation must be developed. In addition to being faster machine methods are much more accurate when large amounts of data are processed. A certain amount of clerical error is inevitable and valuable time can be lost in finding and rectifying such mistakes.

This problem of assignment was solved by a technique which was almost completely mechanized. Through machine matching of master cards expressway routes are developed and compared to alternate routes. Ratios of speed and distance are computed and trips allocated to the expressway network. The unique feature of this method is the elimination of the inspection and coding of data for each of the thousands of zonal trips. Instead information need only be coded for each of the zones. This is known as "one-end" coding.

In the Detroit situation this technique made a complete assignment possible in three weeks including mapping, coding, processing and tabulation of results. The tabulation showed all turning movements for every interchange and the traffic volumes of each route section of the expressway network. The next section describes the mechanics of this assignment technique in detail, and the last section presents a summary and comments.

ASSIGNMENT PROCEDURES

Basis for Assignment

Assignment to expressways was based on combinations of ratios of distance and speed over an expressway and alternate route. A family of distance and speed-ratio curves previously developed and made the subject of a paper presented at the Highway Research Board in January, 1955 was used to allocate trips to expressways.[1] These curves are shown on Figure 1. To utilize these curves, distance and speed-ratios had to be calculated. It was shown in the report referenced above that with an assumption of the ratio of speed on expressways to speed for city street travel the ratio of average speeds could be calculated using only distance measures. Therefore, both the speed and distance ratios could be calculated using only distance measures and an assumption of the ratio of speed on expressways to speed on city streets.

This method of determining speed and distance-ratios made the basic measurements easier but there was still the problem of comparing two routes for each of the many individual transfers between zones.

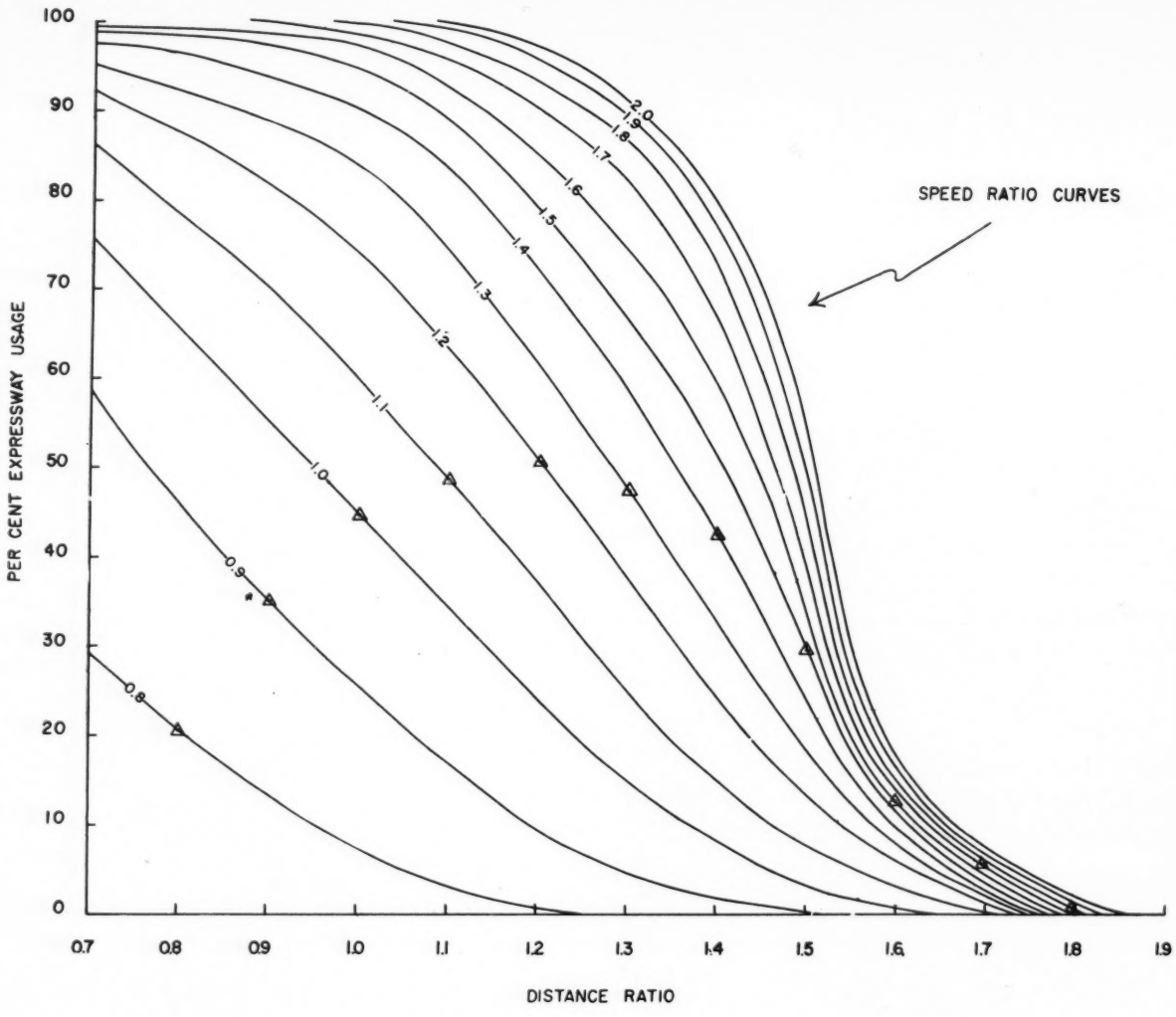
Problem Broken into Parts

The approach to the problem was one of breaking it into its simplest parts and trying to find an answer to each one in turn. The assignment problem can be broken into three basic parts as follows:

1. Measuring and recording distance for the most convenient route of travel via city streets for a traffic volume transfer between two zones.

2. Measuring and recording distances for the same transfer via a route utilizing expressways. This second step was divided into two parts. First, distances were recorded between zones and expressway ramps, (one end coding) and second, distances and turning movements were coded on the expressway between all interchanges.

1 Campbell, E. Wilson and McCarger, Robert S., "Objective and Subjective Correlates of Expressway Use", *Bulletin 119*, Highway Research Board, 1956.



△ INDICATES POINTS WHERE SPEED AND DISTANCE RATIO COMBINATIONS ARE EQUIVALENT TO A TIME RATIO OF 1.0

Figure 1
Expressway usage as related to speed and distance ratios.

3. Comparing the route measurements obtained in step 1 and 2 above and calculating speed and distance ratios and from these ratios allocating trips to expressways.

The procedure used to solve each of these problems is detailed below.

Measurement of Alternate Route Distance

The measurement of alternate route distance was solved completely by machine by establishing the relationship between straight line or desire line distance between two points to the actual over-the-road distance between the same points. If the street system were a pure grid then the over-the-road distance would be the same or very near the same as the right-angle distance. However, streets in the Detroit area were not laid out in a simple grid pattern. Instead there were many diagonal and radial streets. Therefore, to determine the relationship between airline and over-the-road distance a random sample of over 200 individual zone to zone movements was selected for testing. The airline distance was calculated between each pair of zones, and distance via the best arterial route was measured. From a comparison of airline versus over-the-road distance the curve shown in Figure 2 was constructed and a mathematical relationship was determined.[2] Therefore, by knowing the trip length and the airline or desire line distance the over-the-road distance by alternate route could be calculated.

Calculation of airline distance was easily done with an electronic calculator (IBM 604). Since a coordinate grid ½-mile grid pattern had been overlayed and keyed to the study area, this problem was made very simple. Given the coordinates of the zone centers it was simply a calculation of the hypotenuse of a right triangle. As the machine calculated the airline distance between each pair of zones it selected an appropriate factor depending on its trip length and punched into the zone to zone cards the approximate over-the-road distance. This technique made possible a very great time saving. Since the 604 does calculations at the

2 For complete discussion see "The Relationship Between Over-The Road and Geometric Measures of Trip Distance for the Detroit Area," 8pp. mimeo., September, 1955.

rate of 6000 an hour, all the distances by alternate routes were determined in less than 5 hours. The whole process of coding the coordinates of zone centers, punching information and computing the airline distance and over-the-road distance takes one person about two days, and in this case there were 23,500 individual transfers involved.

The second problem was one of tracing and recording a route using expressways between two zones. The solution to this problem is described below.

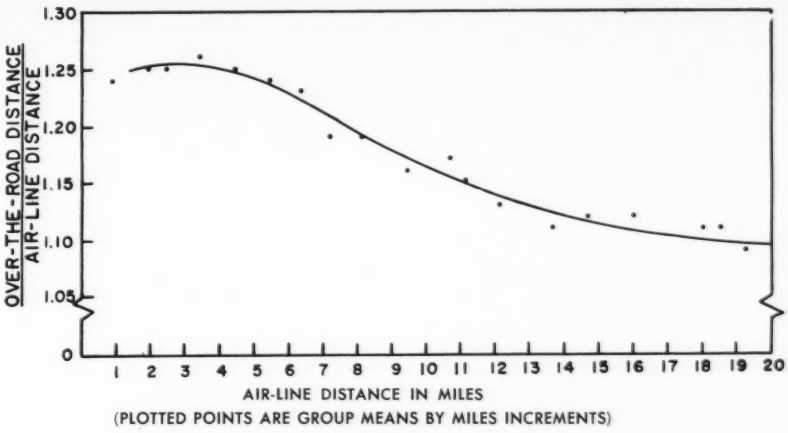

OVER-THE-ROAD DISTANCE / AIR-LINE DISTANCE
1.30
1.25
1.20
1.15
1.10
1.05
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
AIR-LINE DISTANCE IN MILES
(PLOTTED POINTS ARE GROUP MEANS BY MILES INCREMENTS)

Figure 2
Comparison of distance factor and airline distance.
Source: "The Relationship Between Over-The-Road and Geometric Measures of Trip Distance for the Detroit Area." (Detroit Metropolitan Area Traffic Study, 1955).

Tracing the Expressway Routing

Devising a short-cut method to trace the expressway routing was an entirely different problem. Its solution was not as simple as that in tracing the alternate street routing. Since turning movements and expressway mileage were required for the expressway route, it appeared that some manual coding would be necessary. Therefore, efforts were directed toward devising a simple systematic method of manually coding routes so that a minimum amount of manual effort would be sufficient. Many zonal pairs have similar routing for at least a portion of the trip between them. For example, in Figure 3 the route from Zone A to the expressway ramp might be the same when Zone C, D, or X is the destination zone. Likewise the routing over the expressway network might be the same for many pairs of zones. In Figure 3 the route from B to C, D or X is the same over the expressways as the route from A to these zones. Thus much of the routing for these six transfers in the example is duplicated. If a system were devised where information could be coded once then used over and over again whenever needed as part of any expressway trip, the coding and processing of data would be much simpler. This reasoning provided the basis for the expressway route tracing procedure developed by the staff.

Note: *All zone to zone transfers used in this assignment are two-way all vehicle totals representing interchange between zones. All transfers are considered to move from west to east. In other words the zone farthest to the west is always considered the origin and the one to the east the destination even though transfers are non-directional.*

The first step involved coding a route and measuring distance between zone centers and the first or last interchange used in getting to or from the zone. The second step was to determine routings between all possible combinations of first and last interchanges of the expressway network. Routings obtained from these two steps are then combined as various zones match together as origins and destinations and thus the expressway routing is formed.

To illustrate, consider a particular zone and see how the expressway trip would be coded. If this zone is an origin then the destination zones must be east of it. For transfers between this zone and zones in a particular sector east of it there will be an expressway ramp which would provide the best routing when using an expressway for all zonal transfers. These trips all moving in the same direction will pass through the same first interchange of the expressway network and approach this interchange on the same expressway interchange leg. If the zone is considered as a destination zone then the best exit ramp and the last interchange that trips would pass through to get to it would be determined for transfers between it and origins in a specified direction. This kind of routing and coding is done for all zones as origins

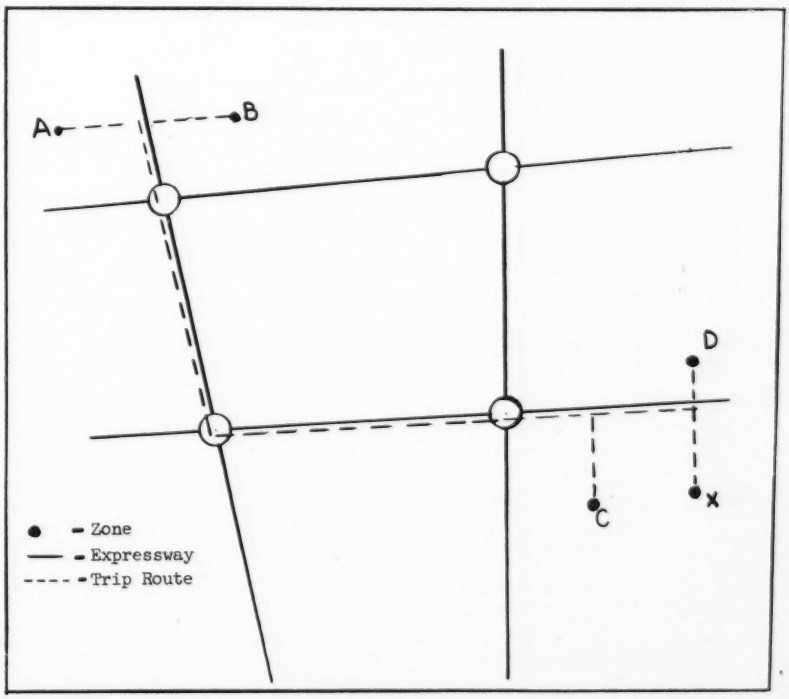


Figure 3
Illustration showing how various zone to zone transfers can have the same trip routing.

and again for all zones as destinations and punched into IBM master cards.

The second operation is to determine and code the best routes between each interchange and every other interchange in the expressway network. In this manner the best route between one interchange and all other interchanges is known. Thus if an expressway routing between one interchange designated the first and another interchange designated the last is desired the card could be found which has this routing coded on it. As part of this coding operation, turning movements were recorded for each interchange lying on the expressway route between all interchanges.

To illustrate how the routing on the expressway is obtained consider a transfer between zones A and B. The routing from zone A to the expressway and to the first expressway interchange will be found on the master card which is coded in step 1 described above for A as an origin zone. Likewise the routing from the last interchange to zone B will be shown on the master card coded for B as a destination as described in step one above. When the cards are pulled, a first and a last interchange number will be shown. Therefore, to get the route on expressways between the first and last interchange, the routing card which is coded in step 2 is matched with the cards on first and last interchange and the card is pulled thus giving the route on the expressway between the first and the last interchange.

This technique matches parts of routes together whenever they are needed to form an expressway trip. A particular card which describes a routing between a first and last interchange may be used with many combinations of origins and destinations. Likewise a particular card describing the route between an origin center and first interchange or a last interchange and a destination zone may be used many times as it combines with different zones to make transfers. Thus trips are coded once but used many times. This cuts down manual work and increases the mechanical work which makes a much faster more accurate job.

Use of Travel Direction Code

There is still one basic step which must be explained. It is true that for zones lying in a particular direction from an origin or destination there is one best route to an expressway ramp and interchange. However, all destinations lie east of an origin zone and they can fall in a sector of almost 180° from just east of north to just east of south. It is not likely therefore that there would be only one best route between a zone and expressway for all trips exported from that zone. To narrow the range of choice of expressway ramps for any zone, all trips were classified into one of eight direction groups depending upon the slope of their desire lines. Although not always necessary this allowed eight choices of route between a zone and the expressway interchange. In coding it was found that for some zones one route served all eight travel directions. Thus, the number of routes and ramp choices made varied from one to eight with few zones requiring all eight.

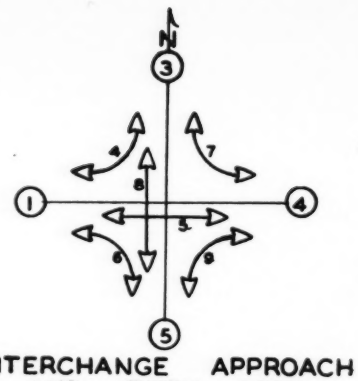


Figure 4

Determining Turns in First and Last Interchanges

Thus far the coding and matching of cards results in obtaining all the information needed for the expressway route except turns in the first and last interchanges. It should be obvious that these turns cannot be recorded in the original coding of the routings between zones and interchanges, because it is not known which zones will match to make trips. From a particular zone all transfers will approach the first interchange but some may turn right, left or go straight through, depending on what the destination zone is and where the last interchange is. To get around this problem a system of interchange leg codes (called approach and leave codes) and turning movement codes were devised. These codes are different from the usual codings in that the turns can be obtained by adding the approach or leave codes. For example, in Figure 4 a vehicle approaching on leg 1 and leaving on leg 3 must make a 4 turn ($1 + 3 = 4$). In the same manner any turning movement can be obtained by adding appropriate approach and leave codes.

How does this help in solving the problem of turns in the first and last interchange? In coding the route from origin to first interchange the approach leg number is coded, and in coding the route between last interchange and destination zone the leaving leg of the last interchange is coded. Then in routing trips between first and last interchange the leaving leg of the first interchange and the approach leg of the last interchange are coded. By adding the approach and leaving codes the appropriate turns are obtained for any interchange.

To summarize the expressway coding quickly, the route coding was done abstractly in parts and matched together as various combinations of origins and destinations occur to form a complete trip. Routing for all zones between zone center and first expressway interchange is coded for eight possible directions of leaving when the zone is an origin. Each zone is coded in the same manner for possibilities as a destination. Routing between each expressway interchange and every one having a higher number is also coded. All codings are transferred to punched cards and trips are constructed by machine matching of master cards to produce expressway routings for all zone to zone combinations.

The coding operation for the 264 analysis zones in the Detroit area took about a week and a half, with six people coding. This included a complete recoding as a check. The success of this kind of assignment depends on the accuracy of coding, since one master card may be used many times and the errors are duplicated each time it is used. A short example follows to illustrate the expressway route tracing procedure.

Examples of Procedure for Tracing an Expressway Trip

Figure 5 represents part of a hypothetical expressway system. Zone 441 in this illustration is an origin and zones 421 and 221 are destinations. A trip from 441 to 421 would fall in travel direction 5 of the eight possible, whereas a trip from 441 to 221 would be in the 3 direction. These zones would have been coded and routing determined for origin and destination possibilities in eight travel directions. For this illustration only the routings for

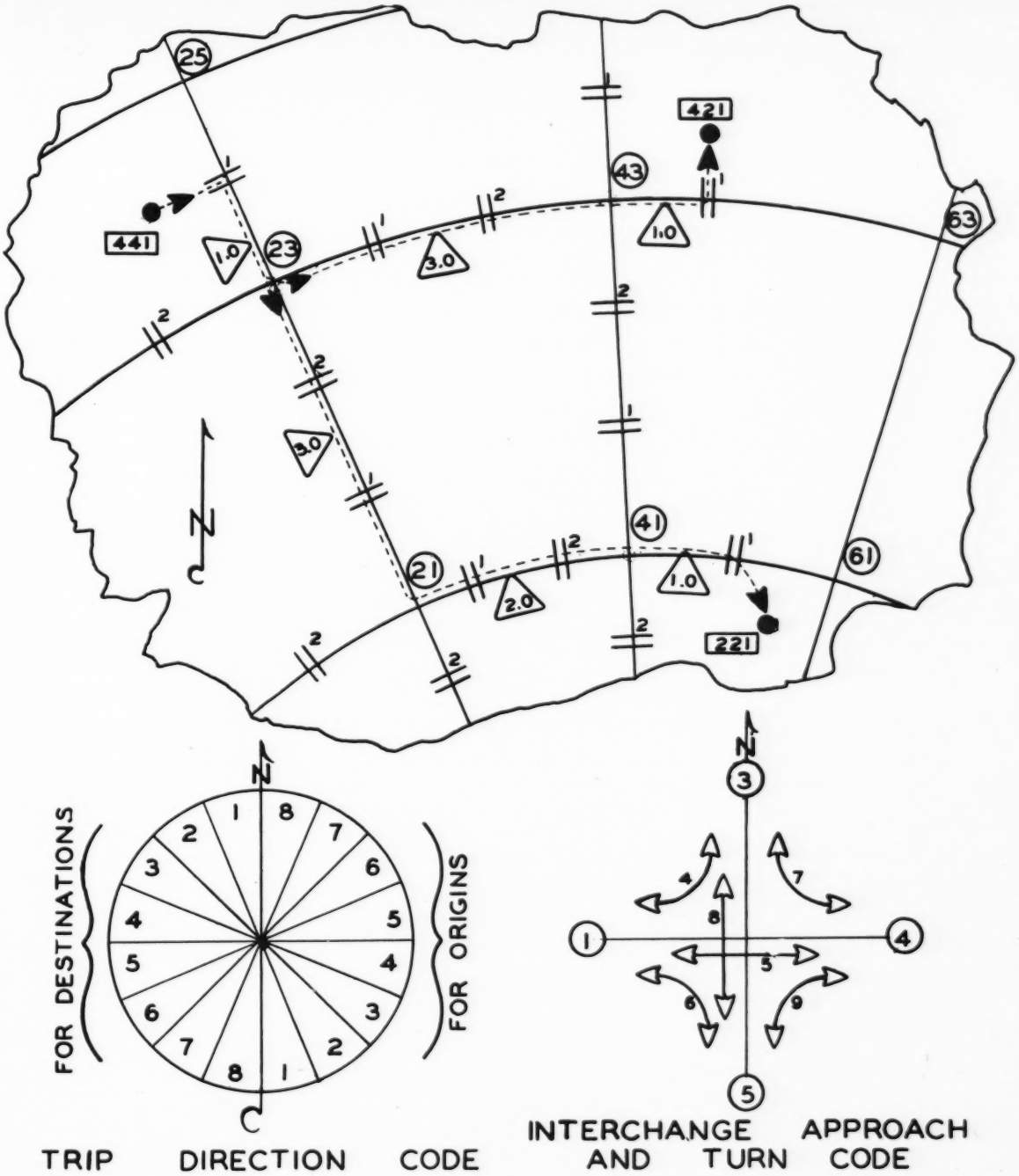


Figure 5
Illustration used to demonstrate trip routing via an expressway.

the 5 and 3 travel directions for the respective transfers are needed. Having the zone to zone movements indicated above, the problem is to match the first, middle and last parts of the route together to form a complete trip via expressways. The coding for the three zones is shown in Table I below.

The first and last parts of the expressway trip can be determined from the Table I entries. The middle part of the trip must be obtained from Table II which follows.

For the transfers between 441 and 421 the following procedure is used in determining the expressway routing. The first entry from Table I shown below is matched with the third entry in Table I. This gives the entrance ramp as 23251 and the exit ramp as 43631. The first interchange the vehicle would pass through would be 23 and the last would be 43. By comparing entries from Tables I and II one can see that the vehicles approach 23 from direction 3 and leave in direction 4. Adding the approach and leave codes results in a 7 turn through interchange 23. This would be a turn from the north leg to the east leg which is correct. The vehicles then approach interchange 43 from the 1 direction and leave in the 4 direction. The approach and leaving result in a 5 movement which is a straight through movement from west to east and is the correct movement for this transfer.

For the trip between 441 and 221 the second and fourth entries from Table I are matched with the second entry in Table II. Results of this matching show the first ramp as 23251 and the last as 41611. The first interchange is 23 and the last is 41 and the vehicle passes through 21 with a 7 movement in making the trip. By adding the interchange approach and leaving codes an 8 movement is obtained for interchange 23 and a 5 movement for interchange 41 which are the correct turns.

Distance for both transfers, via expressways, can be obtained by adding the distance from origin zone to entrance ramp, entrance ramp to first interchange, first interchange to last interchange, last interchange to exit ramp and exit ramp to destination zone. The "airline" distance between zones and ramps must be increased by a factor of 1.25 to convert it to arterial mileage and in addition a tenth of a mile added for each ramp. All of these comparisons and calculations are done rapidly by machine.

Now that the procedure for routing and measuring expressway and city streets trips has been described, the remaining basic problem is to compare the two routes and allocate a per cent of trips to expressways. The solution to this problem is described next.

Method of Comparison of Routes and Allocation of Trips

The third part of this problem as stated earlier was the comparison of trips by expressways and arterial streets and the calculation of distance and speed ratios and allocation of trips to expressways.

All the distance measurements which were required were in the cards so it was simply a matter of card manipulation and machine calculation to determine ratios of speed and distance. Once the ratios were determined the cards were merged with master cards showing per cent using expressways for various combinations of speed and distance ratios. These percentages were then punched into each zonal transfer card. With the percentage allocated to expressways shown in the cards volumes were calculated and turns and section volumes were summarized. These summaries were then printed out and charts prepared showing section volumes and turning movements for the expressway network. The whole process from the beginning of coding to the completion of the flow maps took three weeks.

Test of Method

One hundred zone to zone transfers were pulled at random to check the expressway routing to see if the abstract coding and machine matching could result in accurate expressway routing for the selected transfers. The best expressway route was manually selected and compared to the routing resulting from the mechanical method described in this paper. Less than five per cent of the routings were different by the two methods. Even when the routes differed the per cent of trips assigned to the expressways was only slightly different. Therefore, it appears that this procedure is not only fast but is accurate as well.

TABLE I

Zone No.	Zone is O or D	Direction Code	Ramp of Entrance or Exit	Number of First or Last Interchange	Approach or Leave	Airline Distance Zone to Ramp	Distance Ramp to Interchange
441	1	5	23251	23	3	0.4	1.0
441	1	3	23251	23	3	0.4	1.0
421	2	5	43631	43	4	0.4	1.0
221	2	3	41611	41	4	0.4	1.0

TABLE II

First Interchange	Direction Leaving	Last Interchange	Direction Approach	Turns Through Interchange				Dist. Between Interchange
				21	23	41	42	
23	4	43	1	—	—	—	—	3.0
23	5	41	1	7	—	—	—	5.0

SUMMARY AND COMMENTS

Summary

This paper has presented a fast accurate highly mechanized method for assigning traffic to expressways. Because of the manner of coding information it is called the "One-End" coding method. The reasoning followed in developing the technique was presented along with an example illustrating its use.

Basically the assignment problem was broken into its simplest components and a solution worked out for each part. Several features contribute to the speed and workability of this system. First, is that alternate route distances can be rapidly and accurately estimated by a completely machine method. Second, is the concept of treating an expressway trip in parts, coding and then matching parts togeth to form trips. This eliminates the necessity of reviewing each zone to zone transfer and makes coding vastly simpler. The key to this matching is the system of numbering approaches and turns so that the sum of any two leg numbers gives the turn number which identifies the kind of turn re-

(Continued on page 35)

Residences and Freeways

By John F. Kelley
Headquarters Right of Way Agent
California Division of Highways

In the development of California's freeways, a problem of great significance has been, and will continue to be, the economic effect this modern type of highway facility will have upon the land through which it passes, and the community it serves.

It has been generally accepted that a freeway facility, by its reduction in travel time, brings within the scope of development areas which could otherwise not be developed. In this way the freeway adds to the wealth of the population center by surrounding it with lands of greater value and with potential earning capacity of its occupants so as to increase industrial development and the commercial business of the town or city itself.

However, within this picture of economic growth there exists one major contradiction; this is the expressed opinions of individuals as to the undesirability of residences adjoining a freeway.

Although the freeway offers an unequaled opportunity for the prospective home owner to select the particular area most suitable to his residential desires and remain within reasonable commuting distance from his place of employment, he may retain the opinion that a residence, if adjoining a freeway, is an unwise investment.

If these opinions are shared by a great number of people, they will have a tendency to accomplish a depreciation in value. After all, value, to a great extent, is a matter of opinion. The unfounded fears of well-meaning but uninformed people can create an absolutely false value premise.

Current investigation has revealed that opinions of this type have grown to the point where several lending institutions have adopted definite policies limiting individual loans on homes alongside a freeway.

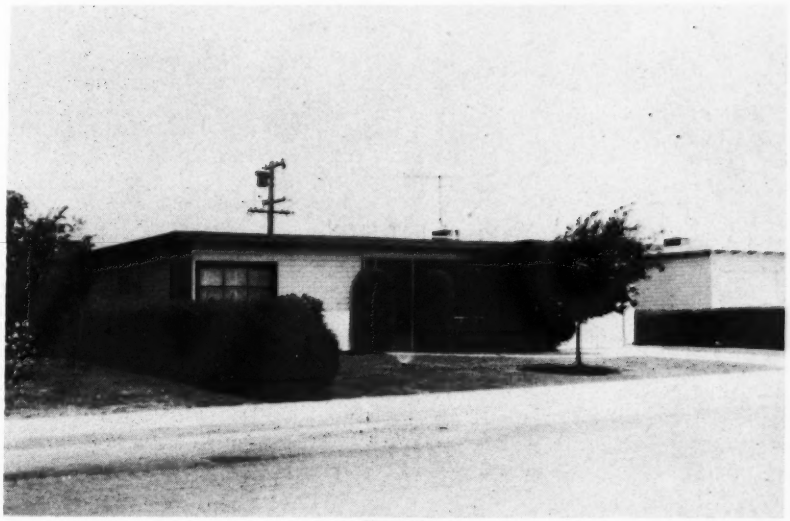


Figure 1
This tract house with back yard adjoining Eastshore Freeway is an example of the less expensive home in this study.

This action by some lending institutions is a clear-cut example of the type of emotional thinking that can create a depreciated value if generally accepted, even though at its inception it may not be supported by factual information.

Public Agency Responsibility

It is the responsibility of a public agency such as the California Division of Highways, entrusted with the purchasing of property for highway construction, to thoroughly determine if, in fact, the value of residential property, as presently indicated by the attitude of the lending institutions, is reduced by reason of its location adjoining the freeway.

Before embarking upon this study, numerous inquiries were made to learn what facts had been developed as the basis for the policy of some lending institutions in taking the position that residential property value was depressed because of its close proximity to a freeway.

We were unable to find any evidence in California, or in any other state, of factual studies having been made to support this policy. We did find examples of polls and surveys that had been made; however, the supporting data used in these articles consisted of random sampling of property owners' comments, and from our own documented experience we know that only limited weight can be attached to this type of data.

Goal of Study

The goal of this study, then, is to make an accurate analysis of how the market value of residences have been influenced by the freeways in California. It is only reasonable that this should be considered from a very practical standpoint. The freeway's benefits in traffic-carrying capacity alone, justifies its cost, and repays many times, in the development of wealth to the community through which it passes. It is not the intention of the California Division of Highways that individual property owners should suffer mone-

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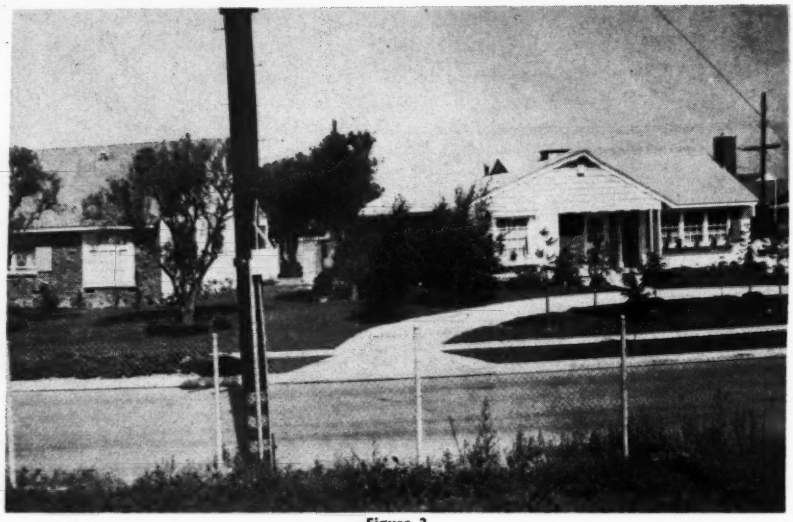


Figure 2
Example of the higher priced tract home. These residences are on a frontage road alongside the Santa Ana Freeway near Paramount Boulevard interchange.

tary loss because of the public's need for freeway construction. It is understood there is not, and never has been, a guarantee of evenly distributed appreciated land value.

A residence, similar to other types of land investment, is subject to a great many economic influences which affect its rise or fall in value on the market. It is not the goal of this study to predict the anticipated future of residential property adjoining the freeway; however, it is felt that a record of past performances will furnish a reliable indicator of what is likely to occur in areas similarly treated. From past experience, we feel reasonably certain that if it is possible to chart the record of performance of a considerable volume for any specific type of property, we will have a basis for future comparison well supported by facts.

The principal benefit from this study will be to provide accurate data as an aid in appraising the market value of residential property near freeways, and in so doing, replace theories based upon opinions with factual data.

Preliminary Survey

The initial step in a study such as this requires a preliminary survey to determine: first, the best possible source of factual information; secondly, the method of obtaining this information; and thirdly, the extent of coverage necessary to achieve the aims.

At the outset, it was decided that the "acid test" in determining freeway influence upon single-family residences was the reaction of those residents living alongside a freeway, as reflected in the actual sales taking place in the open market. If this information could be obtained in sufficient quantity, excluding those sales influenced by conditions that prevent a fair comparison, such as advantageous or restricted financing, forced sales or purchases, etc., it would be possible to make an accurate analysis of freeway impact upon residential property.

The necessity of obtaining a large number of sales, to supply the statistics required, was revealed in the preliminary survey. It was found, in order to obtain an adequate number of sales to establish a reliable indication of market price trend, that it was necessary to make this study on a state-wide basis. The need for the broadest possible coverage for this study became more apparent when an investigation of sales showed that many variations existed with respect to the physical differences of the houses and adjacent freeway, over and above the impact of different local economic conditions upon real estate values.

For these reasons it was necessary to consider many different examples before it was possible to estimate a trend on the degree of freeway impact upon marketability of residential property.

Basis of Study

Four freeways were used as the test areas to provide the data in this study. Two in Northern California, the Bayshore Freeway south of San Franciso in San Mateo County, and the Eastshore Freeway southeast of Oakland in Alameda County; and two Southern California freeways, the Santa Ana Freeway extending southeasterly from downtown Los Angeles into Orange County, and the San Bernardino Freeway east of Los Angeles.

The majority of residential development adjacent to freeway construction in California is located along these four freeways. The market trend revealed by the actual sales in these areas provides the most complete basis for determining how the greatest number of homes subject to freeway influence are affected. With a few exceptions, all of the residences along these particular freeways are in subdivisions. The majority of these tracts were developed after World War II.

Custom-built and Older Homes

Throughout the State, at the present time, there are only a limited number of custom-built and older homes located adjacent to freeways. In most of the cases of this type of residence investigated, it was found that the site selection was one of owner preference. For this reason, and the fact that the custom-built home is usually built and financed in accordance with the desires and financial ability of the owner, it is not subject to the resale activity usually found in the tract-built home.

It follows, in the case of the newly constructed custom-built home, that the owner has made a special effort in selecting his site, and where that site adjoins a freeway this fact adds to its desirability.

In the older home, where an adjacent freeway has been built, after many years of occupancy by the owner the emotional reaction is sometimes out of all proportion to the economic analysis. However, in both of these cases, because of the insufficient amount of sales data, it was decided not to include custom-built and older homes in this study.

Sources of Information

One of the initial problems in conducting this study was how to obtain the factual data required. Although personal calls upon the home owners required a great deal of time, we found it to be absolutely necessary in order to obtain all information needed, particularly confirmation of sales prices and statistics relating to payments for financing. As it was necessary to contact the residents of homes *adjoining the freeways, as well as buyers and sellers of *comparable homes, we used

* In this report, residences *adjoining* freeways refers to the residences that either back up to or face the freeway fence, and *comparable* refers to similar residences within the same subdivision located one block or more away from the freeway fence.

this opportunity to obtain the property owners' comments with respect to living in these localities.

In addition to the sales statistics confirmed by the property owners, the official records in the cities and counties were also used as a source of information relating to real estate transfers in the vicinity of the freeways. The tract developers and their sales representatives, as well as realtors actively engaged in selling residential properties along freeways were called upon for additional information with respect to the problems involved in selling homes in these particular areas.

The excellent cooperation of the many people interviewed to provide confidential information, particularly in relation to financing the purchases or sales of homes, makes it possible to state that the analysis reached in this study is based upon the greatest amount of accurate data available. In appreciation of this help and as a protection to the individuals furnishing financial statistics regarding their homes, all references to selling price, down payment, monthly payments, and other figures are shown in this report by group figures or percentages.

Basis of Comparison

Previous economic studies conducted by the California Division of Highways for the purpose of ascertaining the economic effect of freeway construction upon adjacent property used a "before and after" basis of comparison which shows, by direct contrast, the degree of freeway influence. This procedure is particularly applicable for properties in the process of change or in established business continuing after freeway construction in the same manner as before such improvement.

This state-wide study consists of examples subjected to a considerable difference in economic conditions, as well as a wide variation in construction dates of the homes and adjoining freeways. The degree of freeway influence in this study cannot be measured before and after the date of freeway construction, but can only take place after the freeway is in existence. For this reason it was necessary to use a basis of comparison that would provide a uniform system of analyzing the market trend in areas having variations in the local economic condition.

A careful review of sales statistics in various locations throughout the State indicated that a comparison of resales among similar homes was the basis for making an accurate determination of freeway influence upon the market value for residential properties.

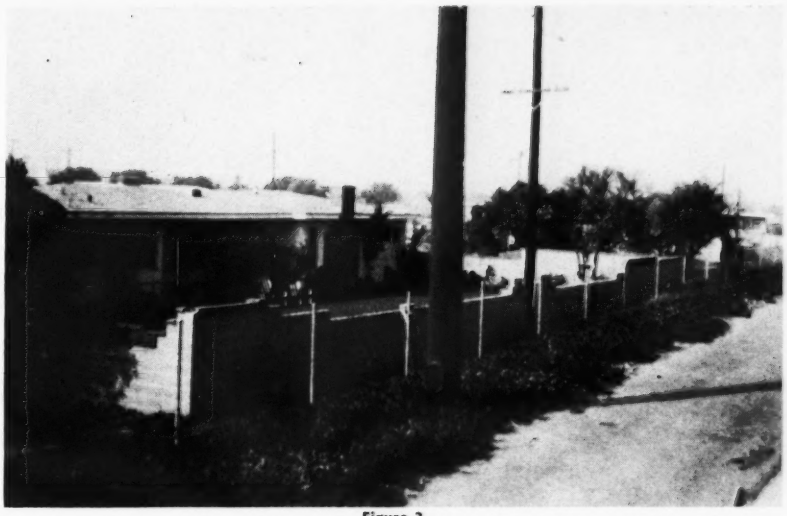


Figure 3
An example of one of the many attractive back yards alongside the freeway fence. This homesite adjoining the Santa Ana Freeway has been enclosed with a concrete block wall to provide privacy for the outdoor living area.

Initial Sales

Proceeding on this premise one of the first observations was that among the many residential tracts included in this state-wide study there was no evidence of builders putting a different "price tag" on a house because it was located alongside a freeway. Subdivision builders usually arrange for the financing of a group of homes or an entire tract as one unit. Discount rates on available money, or any penalties that may be inflicted by the lending institutions, are generally aborbed by the builder, thereby permitting equal financing for every house.

There were a few examples of price changes being made on finished houses in order to complete the sales within a tract. These price concessions were not confined to any specific area, but applied to the houses not selling as fast as the majority of homes within the subdivision.

The only variations found in the uniform financing of new houses occurred where the tract was constructed in stages, and separate financing was arranged as each unit or group of homes was built. A difference of several months could mean a substantial change in the availability of money and the type of financing obtainable for residential loans.

Rising construction costs made it necessary for many builders to increase the price of houses during the period of tract development. Numerous examples were found where the initial selling price of identical houses varied several hundred dollars between the first and last units constructed within a particular tract. These price increases caused by changing construction costs were applied to the houses without any regard to location within the subdivision.

A comparison of the initial prices in a tract with resales of the same houses on the current market has shown a continuous price increase. There has been a remarkable uniformity in the trend of price change among comparable houses within a tract; however, the degree of price change has varied between tracts adjacent to the same freeway. This is indicative that factors inherent in the entire tract, such as the livability and physical appeal of the houses in one tract as opposed to another, or the social and economic status of the residents, have a greater influence on the price trend than a freeway, school, or some other nonresidential use adjoining a small percentage of the homes in a particular subdivision.

Resale Prices

The sale price is indicative of market value only when the parties in the transaction act in accordance with the basic requirements that denote market value. In other words, the buyers and sellers must not be forced to make the purchase or sale; there must be an allowance of a reasonable time, and a full knowledge of the uses and capabilities of the property.

Figure 4
Residences on frontage road alongside San Bernardino Freeway. The chain-link fence through center of photo separates freeway traffic lanes from frontage road.

The use of sales information as the basis for determining the freeway influence upon residential property requires an investigation similar to the collection and processing of comparable data for an appraisal. Each resale of a residence adjoining one of the four freeways included in this study, as well as the resales of comparable properties, required a personal interview with the buyers or sellers for the purpose of verifying the sale price and all circumstances involved in the transaction in order to ascertain if the sales were indicative of market value.

Selection of Comparables

Resales throughout the State included many different types of residential property. The principal variations were: (1) the size of the lot; (2) location of improvements with respect to the freeway; (3) age, quality, type of construction, size and condition of the improvements. A minimum requirement of this study was that each resale of a residence adjoining a freeway had to be compared with a similar residence located one block or more away from the freeway.

Similarity meant that physical as well as social and economic conditions must be the same. It is understandable that it is impossible to find any two residential properties nearly the same after a period of elapsed time, even though the properties were practically identical at the time of initial sale. However, in the selection of comparable properties, the number of variations were kept to a minimum. In each example used, adjustments were made for the few differences which existed that would have an influence on the marketability of the residences.

The result of a selective procedure such as this requires the investigation of a large volume of resales in order to obtain sufficient volume of true comparables to insure accuracy.

In this study all of the resales in all of the subdivisions under consideration were reviewed. This required a complete analysis of 1,092 resales. Of this amount, 520 conformed to the established requirements of the study.

Time Element

In the assembly of sales data along the freeways in Northern and Southern California, we found that by using the three calendar years, 1954, 1955 and 1956 there would be an adequate time base to provide sufficient sales information to make a well-supported analysis of freeway influence upon residential property.

A greater period of time would have made available a larger number of sales, but as it was considered essential that the freeway be in existence at the time of each resale, we were unable to use sales earlier than 1954 along all four of the freeways covered by this study.

By allowing a reasonable time to elapse after the completion of the freeway construction, the adjoining residential resales were made by residents who had an opportunity to experience and determine for themselves the advantages or disadvantages of living alongside a freeway.

Resale Price Trend

All resales occurring in each of the three years covered by this study have been tabulated to compare the annual trend in market value of residences adjoining a freeway with comparable residences. The accompanying chart shows this trend by percentage differences beginning with resales in 1954 as a base.

RESALE PRICE TREND

	1954	1955	1956
Freeway	Base	+1.69%	+4.39%
1 block	Base	+3.35%	+4.71%
Two blocks or more	Base	+0.001%	+4.09%

The use of all sales statistics reveals that there were similar variances in the sales prices for residences adjoining freeways as well as among comparable examples.

The average resale price was 1.69 percent higher for residences adjoining the freeway in 1955 as compared with 1954. The general upswing in the real estate market was further shown in 1956 by the 4.39 per cent increase for these residences adjoining freeways as compared with the gains made in 1955.

The increase in price trend for comparable residences located one block away from the freeway was substantially greater during 1955 than the gains enjoyed by residences adjoining freeways during the same year; however, the market gains during 1956 were only slightly higher than the increase enjoyed by the homes adjoining freeways during the same year.

Those residences located two or more blocks away from the freeway experienced only a fractional increase in the market price trend during 1955, but showed a substantial gain during 1956. Even so, they remained below the gains made during the same year by residences adjoining, or one block from, the freeway.

According to our state-wide tabulation of the resales occurring within this three-year period, those residences located one block away from the freeway experienced the greatest single increase in price trend. The fact that residences located two or more blocks away from the freeway showed gains of a much lesser degree, precludes any assumption that location outweighs all other factors influencing the general market trend. The price trend of the residences located one block from the freeway more closely resemble the gains made by residences adjoining the freeway than the residences located some distance away from the freeway. The

variations that exist between the individual groups of homes in this tabulation limit the comparison to a general indication of the market trend.

Trend for Similar Groups

To show more specifically the price trend of residences adjoining the freeway and comparable residences, a separate study has been made of an equal number of resales which occurred within the same tracts and within the same periods of time, making possible a direct comparison in price trends among residences having the greatest similarity. The number of resales used in making this analysis was limited; however, those used in this phase of the study were nearly equal in every respect with the exception of their location.

SIMILAR GROUP TREND

	1954	1955	1956
Freeway	Base	+0.76%	+2.53%
One block or more	Base	+0.96%	+2.09%

In this limited, but directly comparable group of residences, the annual trend in resale prices from 1954 through 1956 was found to be slightly higher for the homes adjoining the freeway as compared with similar residences located one or more blocks away.

The purchasers in each of these resale transactions assumed the initial financing existing on the property. New financing was not required for any individual residence in this group.

Freeway vs. Away

This same group of sales can be analyzed in an entirely different manner; for example, the above tabulation is a progressive percentage comparison of the price increase in the resale of properties adjoining the freeway with other properties adjoining the freeway. In like manner, it also shows the price trend among comparable properties.

If, however, using this same group we compare the total sales of properties adjoining the freeway with the same number of comparable properties removed from the freeway, the following tabulation occurs:

FREEWAY vs. AWAY

1954 Comparables .....1.30% higher than properties adjoining freeways
1955 Comparables .....1.50% higher than properties adjoining freeways
1956 Comparables .....1.88% higher than properties adjoining freeways

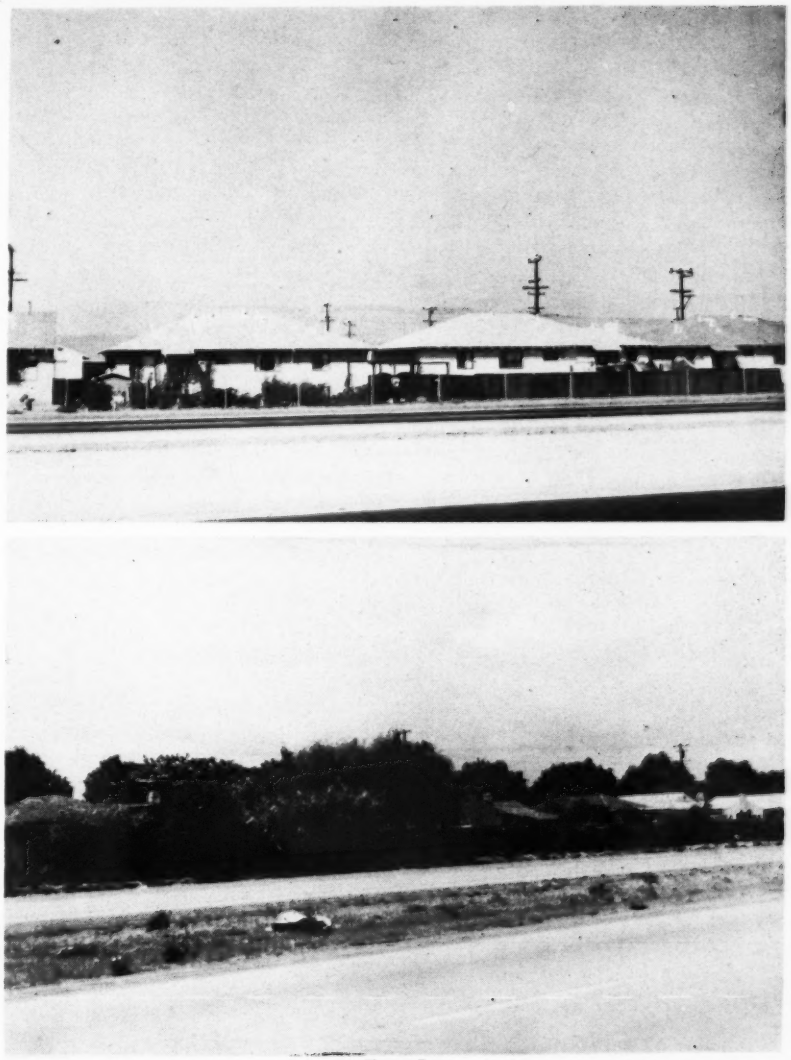


Figure 5
UPPER—New residence with back yards adjoining Eastshore Freeway. One property owner has enclosed back yard with solid wall fence, whereas others are using freeway chain-link right of way fence as rear property boundary enclosure. Note residence in extreme left portion of photo with solid wall-type fence only along the side property boundary. LOWER—Older residential tract along Eastshore Freeway with back yards adjoining right of way. Plantings along rear property boundary greatly improve appearance of homesites adjoining freeway.

From this chart it appears that comparable residences removed from the freeways have enjoyed a slight increase in value over the adjoining residences. Although this slight increase has become progressively larger during the three years covered by this study, we cannot assume the breach will grow wider each year, any more than it can be assumed that the annual price trends for residences adjoining the freeway, or comparables, as shown on the preceding charts, will continue to increase at the same rate.

On the basis of the statistics used in this study, there is a depreciation in market value of approximately 1 to 2 per cent for residences adjoining freeways. This difference in marketability may be the influence of "opinion theories" upon the bargaining practices occurring between buyers and sellers during resale transactions.

Financing

The importance of financing in the analysis of residential sales is made obvious by the fact that over 98 per cent of all transactions investigated throughout the State required the aid of some form of real estate loan. The widespread reliance upon financing will in many cases have as great an

influence upon sale of residential property as the actual sale price. In fact, investigation revealed many instances where home buyers expressed a great deal more concern about the down payment required to cover the equity of the seller, and the amount of monthly payments, than the total purchase price for the property. For these reasons, favorable or unfavorable financing could strongly influence the marketability of a residence.

As an integral part of our investigation of sales statistics we obtained, through personal interview and a review of the official records, the exact cash down payment required for each transaction; the total monthly payment made by the purchaser on the real estate loan covering the balance of the purchase price; and the monthly payment and amount of a second deed of trust or additional loans required for the sale of each specific property.

Average Payments

In this state-wide study the cash down payment for all residences adjoining freeways averaged 12.37 per cent of the sale price. The average monthly payment on real estate loans on these homes was $78.20.

Financing on comparable homes located one block from the freeway averaged 14.91 per cent of the total purchase price for down payments, with average monthly payments of $77.68.

Residences located two blocks from the freeway tier of homes required an average 15.61 per cent down payment during the three years covered by this study, and monthly payments averaging $77.93.

The average down payment for residences located three or more blocks away from the freeway was 14.54 per cent of the total sale price, and monthly payments averaged $81.13 for the purchasers of these homes.

A review of cash down payments for each resale transaction shows those residences adjoining freeways required a smaller average down payment than all other residences having real estate loans, regardless of distance from the freeway.

The average total monthly payment on real estate loans for the residences adjoining freeways was only slightly higher than the monthly payments made for residences one and two blocks away from the freeway which required a substantially larger percentage of the purchase price in the form of a down payment. It is thereby expected that if the size of the down payment increases, there should be a commensurate decrease in the size of the monthly payments on houses having similar purchase prices.

Considering the fact that there was a variation in the range of purchase prices, we should not make the bold assumption that down payments will always be lower for houses adjoining freeways. However, from the statistics which we have, on the basis of loans which have been assumed, i.e., equal financing, there is definitely no evidence that purchasers of homes alongside freeways are required to use any more cash for the purchase of one of these homes, unless, of course, new financing may be required, which might alter the entire picture, depending upon policies of the lending institutions.

Distance and Grade of Freeway

The trend in market price of residences has been based upon all factors being relatively equal, with the exception of a location near or away from a freeway. In this analysis no distinction has been made among the residences adjoining freeways, with regard to variations in distance from the house to the fence or the traffic lanes of the freeway. The grade or elevation of the freeway near the residences is another factor to be considered in how a freeway can influence the desirability of residential property.

Having determined how a freeway location can influence the price trend among similar houses, we have further projected this study to find out what effect the distance or grade of a freeway has upon those resales.

All of the residences used in the comparison of market prices were located within tract developments. With very few exceptions the homes within each subdivision were the same distance to the fence and traffic lanes of the freeway. In those few instances where the distance was not uniform, or the grade of the freeway alongside a specific tract varied, the houses adjoining the freeway in that subdivision were segregated.

The many price variations that exist among a large number of individual sales made it necessary to adopt a system of group comparisons in order to show the influence of distance or grade of freeway upon resale prices. It was determined after considerable review that the resale price range in each tract or group of homes during the three years covered by this study provided a uniform basis of comparison that could accurately depict the relationship between sale price and the distance or grade of an adjacent freeway.

A comparison of all residential resales adjoining freeways in Northern and Southern California revealed that 26 per cent of those transactions within the past three years attained a higher range of prices than was enjoyed by comparable homes during the same period of time. This group of residences adjoining freeways were in locations varying from 35 to 75 feet distant from the state highway right of way fence, and distances ranging from 74 to 200 feet to the freeway traffic lanes. These homes were at an equal grade with the adjoining freeway, or varied to differences as great as 16 feet below the level of the highway facility. Exceptions to this were 9 per cent of the residences being situated 20 feet higher than the grade of the adjoining freeway.

The price range of 36 per cent of the transactions taking place adjoining freeways was lower than the price range for comparable homes. This group of residences were 25 to 83 feet from the right-of-way fence. In comparing this group of homes selling for less money adjoining a freeway with those which attained a higher price range alongside the freeways, we found many of these residences were approximately 10 feet closer to the right-of-way fence. Conversely, there were a few of these homes having a lower price range adjoining the freeway that were eight feet further from the highway right of way than similar homes selling for a higher price.

The residences selling at the lower price range adjoining the freeway were 72 to 105 feet from the freeway traffic lanes. Eighty per cent of these homes varied in grade from "level" to 16 feet below the adjoining freeway. The remaining 20 per cent of these residences were situated above the grade of the freeway from 8 to 20 feet.

The price range of the remaining 38 per cent of the transactions alongside the freeways showed no difference from the price range of comparable homes. This group of residences were 25 to 75 feet from the right of way fence and 72 to 160 feet from the freeway traffic lanes. These home sites varied from 1 to 20 feet below the level of the freeway, with the excep-

DISTANCE AND GRADE OF FREEWAY

Resale price range	Per cent of residences	Distance house to fence	Distance house to freeway traffic	Relation of residential lot to grade of freeway
Higher	26%	35 to 75 ft.	74 to 200 ft.	91% equal or below freeway grade 9% above freeway grade
Lower	36%	25 to 83 ft.	72 to 105 ft.	80% equal or below freeway grade 20% above freeway grade
Same	38%	25 to 75 ft.	72 to 160 ft.	96% below freeway grade 4% above freeway grade

tion of 4 per cent of this group of homes which were located two feet above the freeway grade.

Influence of Distance

A review of the price ranges in relation to the distances from house to fence, house to freeway, and grade of freeway, shows that homes a minimum of 35 feet from the freeway fence sold for more than similar houses located only 25 feet from the fence.

Although there were a number of houses with only 25-foot back yards selling for as much as comparable homes, we cannot overlook the fact that the majority of those houses selling for less money were also residences having 25-foot back yards.

The homes selling at a higher price range adjoining the freeway were the residences situated the greatest distance from the freeway traffic lanes.

The fact that houses showing a higher range of prices were a minimum of 10 feet further away from the freeway fence, and a slightly greater distance away from the freeway traffic lanes than all other homes, indicates that the opportunity for attaining a higher price for a residence near a freeway is definitely possible, but it is not as likely to occur if the residence has a very shallow rear yard or the traffic lanes are too close to the house.

There was no appreciable difference in the grade of the freeway alongside residences selling for a higher price range as compared with homes adjoining the freeway in the other price range groups.

The facts of the study show that a freeway grade up to 20 feet above the lot level is not singularly capable of depressing the resale price of residences. On the other hand, there were also examples of houses 20 feet above the grade of the freeway that sold for prices higher than comparable houses.

Traffic

An additional factor to be considered as a freeway influence is the sound intensity levels resulting from traffic frequency.

The average daily traffic during 1956 on the four freeways in this study ranged from 50,000 to 83,000 vehicles.

The average percentage of trucks in state highway traffic is 30 per cent.

As volume of traffic increases, truck percentage of the total would decrease, because the gain in traffic figures results primarily from additional passenger vehicles; for example, 23 per cent of the Eastshore Freeway 50,000 average daily traffic total is truck traffic, whereas 11 per cent of the Santa Ana Freeway 72,000 total is truck traffic.

The chief complaint with respect to noise from freeways is in regard to truck traffic. As the actual number of trucks on these four freeways is relatively constant, there was no likelihood that truck noises had any more of an adverse effect upon property values in one area than in another.

Houses Adjoining Freeways

The residential tracts included in this state-wide study comprised a total of 22,396 homes, with 1,697 or 7.58 per cent of these residences built alongside a freeway. All residences adjoining the four freeways in this report have their back yards nearest the freeway fence with the exception of a relatively small number of homes along the Santa Ana Freeway in tracts designed with subdivision streets separating the residences from the freeway.

The subdivision plan whereby a row of homes were constructed to have their back yards next to the right-of-way fence provided the most efficient use of land from the standpoint of creating the largest number of lots per acre, and undoubtedly was the reason for that arrangement being the most prevalent.

In making a comparison of the initial and resale prices of homes with back yards adjoining the right-of-way fence, and those residences separated from the freeway by a subdivision street, there was no difference with respect to trend in the selling price or problems involved in making a sale.

In some areas the shape of the subdivision land may have made it more desirable to provide for a street along the freeway fence; however, in many cases it was the general feeling that where streets were placed alongside the right-of-way line, it was done to provide a buffer distance from the freeway traffic. The lack of difference in marketability of these homes as compared with residences having back yards adjoining the freeway property shows this type of tract design was not warranted for that specific purpose.

There were examples of a few subdivisions featuring deeper lots alongside the freeway as compared with other lots in the same track. In some instances this was attributable to a small surplus land area remaining after the tract development. The subdivider added the small additional area to the tier of lots adjoining the freeway as an added sales incentive to home buyers. In other cases the larger lots adjoining the freeway were the result of extra area remaining in the tract caused by the freeway not being located at right angles with the subdivision streets.

In tract developments where homes were constructed, differing in price and size, it was generally the practice to equally distribute these homes throughout the tract, irrespective of location, except in those cases where an entire unit of larger or higher priced homes was constructed at a later date, featuring a variation from the original tract construction.

Fences

The State Division of Highways places a chain-link type fence along the outside limits of the freeway right of way through urban areas. This fence often serves a dual purpose in being used as the rear property fence for residences adjoining freeways. It was surprising to find many back yards adjoining freeways where the chain-link fence was being utilized as the rear property fence, and a solid wall-type fence had been used along the side property lines.

In some areas the F.H.A. or local governing authorities require a screen separating homesites from any non-residential use, such as a freeway, schoolyard, or canal. In these cases the home builders have been required to construct a solid fence of wood or cement along the rear property boundary and

parallel with the state right-of-way fence. Some home builders have voluntarily constructed a solid wall-type fence around the perimeter of a tract. These fences are usually considered a special feature by the home buyers. There was a surprisingly large number of home owners who stated that a solid wall fence along the rear property boundary was the principal reason that particular home was purchased in preference to a residence away from the freeway or tract perimeters.

Exterior Appearance

During the personal interviews and investigation of sales statistics there was an opportunity to observe the exterior appearance of the residences, and particularly the yard area nearest the freeway. There were a similar number of homesites adjoining freeways improved with outdoor living facilities, such as patios, barbecues, etc., as were found among a comparable number of homes located away from the freeway. In both locations there were also examples of lack of care or use of the yard area. The home owner's initiative or efforts in the development and use of the yard area was not influenced by location of the residence adjoining a freeway.

There was no noticeable difference in the street appearance of homes adjacent to the freeway as compared with the front appearance of similar homesites within the same residential tract.

Houses vs. Freeway Construction

Along the four freeways included in this study, 94.58 per cent of the residences were under construction or finished before the final completion date of the adjoining freeways. This group includes a number of residences built in anticipation of a freeway far in advance of the actual construction date. For example, 10.25 per cent of the homes alongside freeways were completed 12 years prior to completion of the adjoining freeway; 4.12 per cent of the homes were completed nine years prior to freeway construction, and 2.95 per cent of these residences were finished eight years before the adjoining freeways.

Residences built after completion of the adjoining freeways represented 5.42 per cent of the total number of homes alongside freeways in this study.

Regardless of the time element, all residential tracts in the vicinity of the freeways were built with the knowledge of a proposed new highway facility through the local area. Although the builders and realtors were aware of the future highway plans, our investigation revealed there were a number of home buyers who apparently purchased residences without giving any consideration to the vacant strip of land set aside through a newly developed area for the future construction of a new freeway. Despite the fact that some property owners may have purchased their homes without the full realization of how the adjoining area was to be developed, we did not find any marked difference in their attitude toward the freeway after it was completed as compared with the home owners who purchased during and after the construction of the freeway.

Residents' Comments

The investigation made to obtain the factual data required for making this study afforded the opportunity to also get the opinion of property owners in regard to living alongside a freeway. Opinions are an indication of public reaction; however, like all polls they are an expression of the individual's attitude at the time of the interview, rather than the result of his considered thought and analysis of homesite selection as reflected through a sales transaction. The comments from residents living alongside freeways are included as a part of this report for informational purposes.

Reason for buying house alongside freeway

32.64% Liked house.
38.17% Freeway not considered; immaterial.
10.00% Convenience of freeway transportation.
19.19% Miscellaneous reasons.

Had you preferred or tried to buy in this subdivision away from the freeway?

56.34% No.
19.28% Yes.
24.38% Freeway of no consequence.

Type of street formerly lived

67.87% Residential street, quiet.
19.18% Residential street, heavy traffic.
12.95% Rural, Commercial, Freeway.

Would you buy alongside a freeway again?

46.11% No.
39.90% Yes.
13.99% Undecided.

Any problem in financing purchase or sale?

96.90% No.
3.10% Yes.

Any fear of theft or danger living near freeway?

85.52% None.
7.77% Fear vehicles come through fence.
6.71% Prowlers, fumes, vibration.

Noise

41.80% No bother.
32.84% Slight objection.
15.92% Objectionable and noisy.
9.44% Trucks principal objection.

General Remarks

47.97% Freeway location no better or worse than other areas.
22.45% Prefer freeway location.
20.40% Do not like freeway location.
9.18% Freeway a transportation benefit.

Conclusion

The purpose of this state-wide factual study has been to determine how the market value of residential property is influenced by freeway construction. Through the collection and analysis of sales data, covering a three-year period of time, supported by a comprehensive study of the principal factors influencing the marketability of residential property along freeways, we have reached the following conclusions:

1. The annual trend in resale prices among subdivision homes adjoining freeways follows a pattern consistent with the price trend of comparable homes. This comparison was based upon residences being equal in every respect possible with the exception of locations.

2. Resales averaged from 1 to 2 per cent less for residences adjoining freeways, as compared with similar homes one block or more away. This indicates there is a nominal depression in market value caused by close proximity to a freeway.

This slight difference occurring among resales can be attributed to the widespread doubt, resulting from opinions that freeways have an adverse effect upon the market value of residential property. These opinions can influence the bargaining procedure that usually takes place between buyers and sellers during resale transactions. This procedure normally does not occur during the initial sale of subdivision

(Continued on page 46)

A Traffic Rotary Gets a New Lease on Life

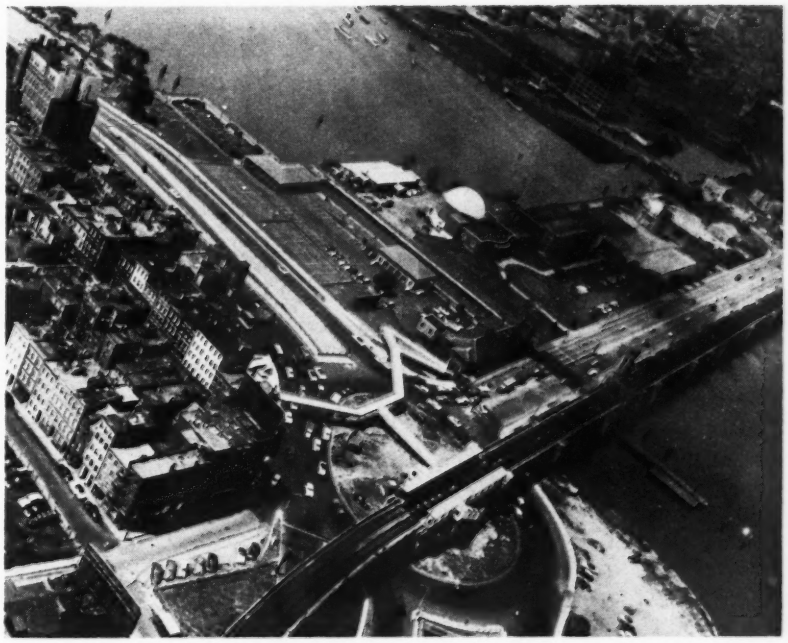
By Roe P. Hendrick
(Jun. Mem., ITE)
Traffic Engineer
Bruce Campbell & Associates

MUCH TIME, effort and a great deal of money has been, and is currently being, expended on the elimination of traffic bottlenecks. In rural and suburban areas, provisions for the orderly flow of both vehicular and pedestrian traffic can usually be accomplished at a relatively nominal cost. Traffic volumes in rural and suburban areas usually do not warrant the complete separation of diverse flows, except in the case of major arterial or circumferential highways. When grade separation is required the land taking costs are usually a minor portion of the total cost of such construction and little if any relocation of displaced families is necessary.

However, vehicle and pedestrian traffic volumes and parking all become progressively more acute as the centers of metropolitan areas are approached. There is little doubt that more expressway-type facilities will be required to meet the urban transportation needs of our present and future economy. These projects, of necessity, require large capital expenditures and often many years between the conception of the overall basic plans for highway facilities and the time when the facilities are completed and opened for public use.

Until such high-type highway facilities become a reality, the skills and know-how of those charged with the traffic planning and engineering function must be directed, in part, towards the provision of immediate or "near term" relief from traffic congestion.

A case in point is Leverett Circle located on the northern edge of the Boston Central Business District (see Fig. 1). While Leverett Circle functioned as a circle, or rotary, and thus involved traffic operations which were basically different from the more normal direct crossing type of intersection,



Leverett Circle, prior to improvements.

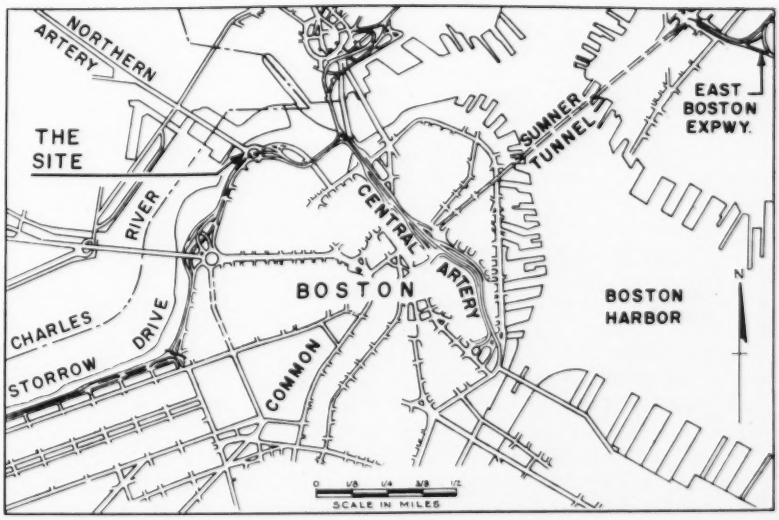


Figure 1

it was nevertheless typical of an intersectional type design popular in our larger cities in the past. The rotaries or circles were usually designed to connect two or more main highways or boulevards and could accommodate moderate traffic volumes. With the large increase in vehicular traffic experienced in recent years, these circles or rotaries tend to break down trafficwise in ever increasing numbers. The primary reason is the inability of the small circles, or rotary, to handle the weaving maneuvers necessary for successful operation.

In order to fully comprehend the importance of Leverett Circle, as a vital link in the highway system of the downtown Boston Area, a few statistics may be helpful. In March 1955, in excess of 47,000 vehicles entered the Leverett Circle intersection at grade during the eleven hours between 7:00 A.M. and 6:00 P.M. by actual manual field counts. The estimated 24 hour volume was approximately 75,000 vehicles, with commercial vehicles averaging 10 per cent of the total traffic volume during both morning and afternoon peak periods and 15 per cent in the off peak periods. The existence of a vehicular tunnel passing under the intersection, and carrying westbound traffic from the Boston Central Artery to the west via Charles Street and Storrow Drive, fortunately did not affect traffic operations at grade within the intersection.

The circle is a terminus for Charles Street and Storrow Drive, a major arterial highway leading to the west, and the southern terminus of the Northern Traffic Artery. Both roadways are under the care and control of the Parks Division of the Metropolitan District Commission. An "on ramp" to the Boston Central Artery, a facility of the Mass. Department of Public Works, leads traffic from Leverett Circle to downtown destinations near the market, financial and insurance districts. Nashua Street, under the control of the Boston Traffic Commission, carries traffic from the North Station area through the circle to the North and West.

Prior to the recent channelization and signalization, the traffic control for this rotary intersection was provided by police officers of the Metropolitan District Commission during both the morning and evening peak traffic periods, and intermittently during the day whenever undue traffic congestion occurred. The location of the Metropolitan District Commission Lower Basin Division Police Headquarters directly adjacent to the circle permitted continual observation of the circle and placement of police officers as they became necessary.

Traffic volumes did not constitute the total problem. Several unusual conditions had to be considered in any overall plan. The first was the existence and operation of the drawbridge operating in conjunction with the locks in the Charles River Dam within 250 feet of the circle. The locks permit the passage of both pleasure craft and commercial vessels from Boston Harbor and the lower tidewater portion of the Charles River up into the fresh water lower basin of the Charles River. Normal operations of the bridge required a three to four minute average opening which completely stopped all traffic within the circle and built up sizeable backlogs of waiting vehicles on all approaches. The presence of the high density residential area and structural limitations imposed by the existing Metropolitan Transit Authority's elevated station and structure were other considerations which could not be overlooked.

When the planning phase was begun pedestrian crossing at this location, except via pedestrian overpass, ranged from difficult and extremely dangerous to impossible. A pedestrian overpass had been completed in June 1955 permitting pedestrians to cross Charles Street and also to enter the Metropolitan Transit Authority's Science Park Station. Planning had also begun for the construction of a second pedestrian overpass from the Science Park Station to the north side of Nashua Street. The proximity of the large office building housing the main offices of the Mass. Department of Public Works and the Mass. Registry of Motor Vehicles, the Science Park Museum and the recreational facilities along the Charles River all contributed to the large volume of pedestrians crossing at Leverett Circle.

It was readily apparent that nothing short of a high level bridge over the locks, accomplished by major construction involving large land takings and resultant damages on the Boston side of the dam, could completely remove the congestion caused by frequent bridge openings. A scheme for the relocation of the locks in the center of the dam was investigated and shelved due to the extreme costs involved and the forced channel alignment due to downstream restrictions. It was clear that the problem of immediate relief of traffic congestion would have to be attempted by the use of traffic signal control and minor changes in the geometric design of the intersection and its immediate surroundings.

Before any detailed planning could be initiated, it was necessary to acquire a complete knowledge of vehicle volumes on each approach and their respective movements within the circle. Manual counts were taken on all approaches and then a combination of "total" and "proportional" counts were taken of the various movements upon entering the rotary. The sight restrictions, presence of large commercial vehicles and large volumes made the counting procedure difficult and necessitated "proportional" counts to check the validity of "total" counts. The percentage of traffic which desired to return to the general area from whence it originated was found to be extremely small for each approach.

A study of reported accidents at Leverett Circle indicated that 40 per cent involved vehicles weaving, either within the circle or on the immediate approaches. Another 21 per cent were rear end collisions, the majority of which were the result of the weaving inherent in rotary traffic operations. It was therefore estimated that approximately 60 per cent of the reported accidents could be eliminated by the proposed redesign.

Since the new signal system has not been in operation for a full year, a comparison between predicted and actual accident frequency remains to be made.

Several schemes were prepared and given careful study and as is often the case, the simplest proved to be the most feasible, and incidentally, among the least expensive. If the circle were to be separated into three intersections, (See Fig. 2) and signals so set that progression could be obtained from the first intersection encountered on any particular approach to the second, then the major portion of all approaching traffic would be able to proceed through the overall intersection in a progressive movement. This scheme proved to be adaptable to the geometric layout of the existing circle based on travel time between intersections

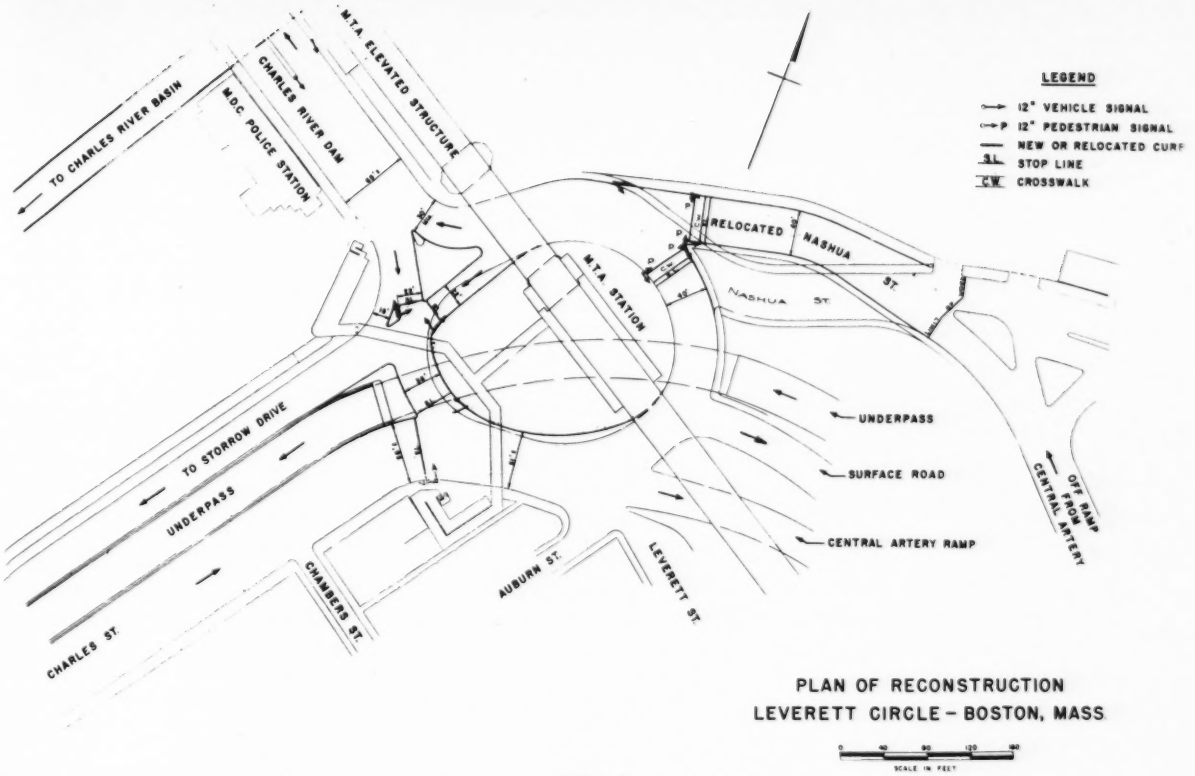


Figure 2

and the clearance time necessary to clear each approach during a signal cycle. Because of the need for adequate width and proper alignment to insure efficient traffic operation, it was necessary to make minor changes in the curb alignment of the inner circle and to construct islands necessary for proper channelization in conjunction with the proposed signal operation. Relocation of the Nashua Street approach was necessary to eliminate the reversals in alignment of the existing layout and to afford smoother operations at this particular location.

This scheme also provided a bonus in the form of pedestrian protection which might otherwise have necessitated the construction of the previously mentioned proposed pedestrian overpass from the circle to the north side of Nashua Street. (Because of poor foundation conditions, it was estimated that the cost of the proposed pedestrian overpass would exceed the total costs of the redesign planned for Leverett Circle.) Since under the proposed redesign, the intersection of Nashua Street and the circle would be operated as a two phase signal, one of the two traffic flows would always be stopped permitting the crossing of the stopped approach by pedestrians. A maximum pedestrian crossing time under signal operation of approximately 40 seconds was available, as opposed to about the equivalent time which would be used in a pedestrian overpass crossing involving the use of stairs, ramps or a combination thereof. Exclusive pedestrian signals were therefore incorporated in the design. All normal pedestrian movements about the circle were thus afforded the protection of either pedestrian signals, which did not require the subtraction of any green go time for vehicles, or of the pedestrian overpass.

The problem of congestion resulting from bridge operations still existed and its complete solution was not possible under the design conditions. Some relief could be provided by means of signal control and further study of this phase of traffic operations produced a partial solution to the problem. The scheme proposed for normal operations was further developed to provide for the interconnection of the existing drawbridge signals with the proposed signal system. A special preemption relay activated by the bridge signals could, after a proper clearance interval, provide for the continuous movement of traffic out of Nashua Street to Charles Street and Storrow Drive, and traffic from Storrow Drive would be permitted continuous movement to the Central Artery during the bridge pre-emption interval. Only those wishing to use the bridge would theoretically be held up until such time as the bridge was actually closed and ready to receive traffic. (It later developed that in actual practice, during long bridge openings, traffic desiring to cross the bridge does extend into the intersection causing minor congestion, but by means of the signals is cleared in a minimum of time following the bridge pre-emption. When the signals return to normal operation, following a bridge opening, they begin the interrupted signal program at the start of the green period for these approaches which have been held up during the bridge opening.)

The final design for Leverett Circle incorporated all of the features mentioned and provides a separate signal program for morning and evening peak hours as well as a program best suited to off peak hours when traffic volumes are not as directional as during the peaks. Careful planning of regulatory and directional signs was a necessary part of the re-design. By proper placement of advance directional signs both

(Continued on page 46)

The Expanding Role of Traffic Operations in Cities and States

By D. Grant Mickle
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Automotive Safety Foundation

A paper presented before the 10th Annual Meeting of the Western Section, Institute of Traffic Engineers, in Denver, June 1957.

THERE IS A PHRASE which many of you have heard: "If you have been doing something the same way for twenty years, you are doing it wrong."

That phrase applies particularly in the case of highway transportation administration. This field is undergoing such rapid and important changes that yesterday's truth may easily be tomorrow's falsehood. What is valid practice today may be questionable procedure for next year's situation.

Consider how highway transportation administration has changed in recent decades. First it was a simple task of building and maintaining a system of roads and streets designed largely to provide access to property. Today it embraces the complex job of planning, building and operating a complete highway network that now accommodates more than 65 million vehicles. With the expected growth of vehicle registration and use, this responsibility will continue to increase.

Even more significant, perhaps, is that the pattern of vehicular traffic will change in character as well as increase in volume. Ponder for a moment what limited access will mean to traffic operations.

The keystone in any system of safe and efficient highway transportation is sound administrative structure built on a foundation of up-to-date law. That keystone of sound organization of the traffic management function is what is lacking in so many political jurisdictions today. Judging by the way they have organized traffic management—or rather failed to organize it — many communities apparently still have refused or failed to accept the idea that the automobile is here to stay.

If anything is needed to reinforce that conclusion, the Foundation has uncovered ample evidence in the management studies it has made for various communities. Generally speaking, the story is the same in the several cities we have surveyed. Instead of a single department and one executive responsible for street and traffic affairs, we have found responsibilities dispersed among a dozen or more agencies.

In a representative case, no better or worse than the average, we found 21 agencies and 66 separate executives with major responsibilities in street transportation management. Instead of taking a week or two to install a needed stop sign, it took half a year. Instead of a single public hearing on a one-way street proposal, there were three or four hearings before different bodies. The only reason things got accomplished was because the high calibre men involved made the organization work—after a fashion.

We feel that the same men, expending the same energy, could do a much better job if given the proper administrative tools.

If the street transportation job is to be done properly, a number of things are necessary. Let's list them first and then examine them in a little more detail.

First, we need to define those activities of government which are properly street transportation management functions.

Second, we must proceed to a logical and orderly arrangement of those functions within the unit of government concerned.

Third, we must provide for effective inter-governmental relationships between the various levels of government — city, county, state and federal — which have responsibilities in this area.

Fourth, to achieve a plan of organization better suited to present day needs, we must carefully explore the possibilities of developing new administrative agencies of government, such as metropolitan area authorities that cut across existing jurisdictional lines.

Fifth, in addition to proper organization, we must develop sound quantitative standards so we will know how much of any given service is wanted and needed by the public.

Perhaps it seems elementary to begin our whole approach to better traffic management by defining the functions. But it's the very failure to do so, that lies at the root of the problem in so many areas.

Street transportation management, for study purposes, can be divided into seven principal functions: Planning, Design, Construction, Operations, Public Transportation, Maintenance and Inventories and Records. This grouping has an interesting feature — one with which you may or may not all be in agreement. There has been no basic cleavage in this list between the structural and non-structural aspects of the management task. The arrangement is, rather, chronological.

"Street and Traffic Planning" is the collection and analysis of facts to develop a coordinated program of action. It deals with the future, although it may study the past. So we place it first in our chronological listing. It is non-structural in its approach.

"Design" still looks to the future, but the more immediate future of that which is actually to be built. It deals with design criteria and standards and with the use of construction materials to satisfy the needs of the user. True design is a blend of structural and non-structural considerations, for the user and the material together form the measure of successful design.

The "construction" function in most city and state organizations is an ex-

tension of design—the inspection and acceptance of the work of the contractor as he translates the paper plans into reality. This is primarily a structural phase but in cramped, urban conditions, the user must often be allowed for, even during construction.

After a project has progressed through the planning, design and construction phases it has come from future to present. To make it and keep it available to the user we have "maintenance" to look after the structural condition of the facility and "traffic operations" to care for the non-structural. In addition, there is "public transportation"—control of the use of the street system by for-hire public carriers: buses, taxicabs, etc.

Finally, completing the chronological listing, is "record keeping," the vital link with the past.

These seven functional groups embrace the field of street transportation management and provide the framework upon which the activities of various existing divisions and bureaus of government may be segregated.

It is felt that assembling all of the elements of street transportation management on the basis of their functional relationships is more sound than grouping on the basis of the skills or training involved. It results in a minimum of overlapping of authority, duplication or skipping of important elements.

There is no "best plan" for coordinating transportation functions in all cities. Each city has individual characteristics which will dictate the type of organization that will best serve its needs. The principle of consolidation of related functions would, however, apply as would the criteria of maximum facilitation of street transportation affairs.

It is not essential to have outside assistance in evaluating the present administrative structure of a city. Most readers are generally familiar with the work of the National Committee on Urban Transportation. This Committee has been active for over two years in devising a comprehensive guide to the development of urban transportation programs. This guide and the companion procedural manuals are to assist cities in carrying out this essential responsibility on a permanent, continuing basis. One section of the Committee's work has dealt with administration and a manual has been produced describing in detail how an administrative study should be approached, what basic information is needed and how it should be analyzed. This manual would be of great value to a city undertaking its own administrative review.

Although there is no single blueprint for organization that will fit all communities, there are certain basic principles of good administration that will be generally applicable. The first rule of effective organization is that related and interdependent functions be grouped, to the maximum possible degree, under one administrator.

In a smaller community this will mean that all street functions—planning, design, construction, operations and maintenance—should be grouped under one man — probably the public works director. He, in turn, should delegate authority on the same basis. Street operations might be the exclusive job of one man or it might be combined with planning or design if the department is small.

In large communities the magnitude of the problem justifies a department devoted exclusively to street transportation, just as states have established broad highway departments. Its function would encompass off-street parking and public transportation to the extent that the city is active in these fields.

As a second general rule, each major division should have clearly defined duties and authority sufficient to discharge these duties. There should be a minimum requirement for specific clearance of individual actions. These limits of responsibility and authority should be spelled out in writing in the basic law of the jurisdiction or in official administrative orders. There is no easier way to determine where assignments overlap or leave gaps than to draw up a written statement of duties. This process may point out, also, where administrative and policy decisions have become confused. It is not uncommon for the policy level of government to hoard to itself decisions which are properly placed at the technical, administrative level. Certainly the requirement of city council action and the mayor's signature authorizing each parking sign in a city is an example of poor delegation of authority. The Council should be informed of, and approve, the general criteria or warrants established by the department. The application of these warrants to specific situations is better handled at the technical rather than political level. Implementing this decision with appropriate signs and markings is obviously an administrative act.

The problem of sound administrative organization is not restricted to the city. States also are concerned. At the annual meeting of the American Association of State Highway Officials, in Seattle, two years ago, the Committee on Traffic discussed in a panel session, the subject, "What Constitutes a Complete Traffic Engineering Program." This discussion brought out wide variations in the scope and nature of traffic engineering programs in several states, and variations in methods of their accomplishment. In many highway departments, the functions of traffic operation are delegated to several different divisions. Efficient management is further hampered by lack of clear definitions of the nature and scope of traffic operations.

To fill this need, a special committee of the Committee on Traffic was formed. The purpose of this committee is to determine the types and kinds of activities essential to a sound traffic operational program and how these actions can best be carried out by a state highway department in light of present and anticipated traffic demands. As in many other AASHO projects, recent advances in highway development and in automotive design, as well as increases in traffic, have stimulated the need for such an undertaking.

In attempting to tackle the job, the committee felt that it should first determine the types of activities that are related to traffic operations, and the extent to which these activities are being carried out by state highway departments. Then the ways these activities are carried out administratively in various state highway departments should be investigated. It was felt that when this phase was completed, the committee could better approach the more difficult phase of this work—that of establishing the level of traffic operations services which should be provided and how these services could best be performed.

Once the states and the cities have a sound management structure, the groundwork for effective intergovernmental relationships has been laid.

(Continued on page 50)

MERGING
TRAFFIC

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GENERAL ELECTRIC

Traffic News

Yale Offers Traffic Engineering Fellowships And Scholarships

A number of fellowships and scholarships in Traffic Engineering at the Yale Bureau of Highway Traffic are available for the academic year starting in September, 1958, it has been announced by the Bureau. These awards are open to engineering graduates who wish to pursue professional careers in the field of street and highway planning, design, and operations.

The Yale University Committee on Transportation awards fellowships on a competitive basis to applicants who are citizens of the United States. Each fellowship offers $2,000.00 which provides tuition and a living stipend of $175.00 each month during the academic year. The fellowships will be similar to those awarded last year as described below:

Automotive Safety Foundation Fellowships—Applicants should have had practical experience in city or state highway engineering, or in related fields. Preference will be given to those applicants who are now employed by public agencies in street and highway engineering and who secure a leave of absence in order to return to their present employer.

Esso Safety Foundation Fellowships — Candidates for these fellowships must be citizens of the following states: Maine, Vermont, Rhode Island, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Tennessee, Arkansas, Louisiana, and the District of Columbia.

The James S. Kemper Foundation Fellowship — This fellowship is not restricted to any particular group or region but is available for professionally qualified men desiring to pursue the profession of traffic engineering.

Liberty Mutual Fellowship—Applicants for this fellowship must show evidence of aptitude and interest in traffic engineering. They are not restricted to any particular group or region.

The Committee on Transportation also awards tutition scholarships to deserving students. These awards do not provide living stipends. Special consideration will be given qualified applicants who receive living stipends from their employers while in school. The course has been approved by agencies providing financial aid to veterans and foreign students.

Applications for admission and special forms for fellowship application may be obtained by writing to the Director, Bureau of Highway Traffic, Yale University, Strathcona Hall, New Haven 11, Connecticut. The closing date for filing fellowship applications is March 1, 1958.

Plans for International Study Week Announced

Preliminary program details have been announced by sponsors of the Fourth International Study Week in Traffic Engineering, scheduled for Copenhagen in September 1958.

The Joint Committee, established in 1954 by the World Touring and Automobile Organisation (OTA) and the Permanent International Association of Road Congresses (PIARC) to plan these Study Weeks, has now been expanded to include a representative of the International Road Federation (IRF). Furthermore, the World Touring and Automobile Organisation has decided to hold an International Congress devoted entirely to Road Safety immediately following the next Traffic Engineering Study Week.

The object of these modifications to previous practice is twofold: in the first place, road planning and construction, traffic engineering and road safety are closely interrelated subjects; many research workers and administrators find themselves involved in some degree with each: in the second place, officials concerned purely with road safety matters have had little opportunity to date to exchange ideas with their opposite numbers in other countries: they have certainly not had the same opportunities as have had traffic engineers.

Encouraged by the success which has attended the organization of the first International Study Week in Traffic Engineering in 1953, The World Touring and Automobile Organisation has accordingly decided to sponsor jointly with International Federation of Senior Police Officers an International Road Safety Congress to be run on broadly similar lines. By holding the Road Safety Congress following the Study Week in Traffic Engineering, all prospective participants are thereby given a choice of attending either or both meetings.

At the invitation of the Scandinavian automobile and touring organisations affiliated to the OTA, the Fourth International Study Week in Traffic Engineering and the First International Road Safety Congress will be held in Copenhagen in September 1958. The Study Week in Traffic Engineering will be held from 16th-21st September and the Road Safety Congress from 21st-23rd September. The two meetings will be administered separately in so far as the enrollment and registration of delegates, the issue of documentation, etc., are concerned, so that delegates will be able to decide whether to attend one or both meetings.

In the case of the International Study Week in Traffic Engineering, the OTA/PIARC/IRF Joint Committee, assisted by a Sub-Committee of Experts, whose members include several well-known European traffic experts, have selected six main themes for discussion. Some fifty experienced traffic engineers and specialists have been invited to prepare reports or papers on these themes. In addition, the Sub-Committee is preparing summaries of previous research on each theme.

For the Road Safety Congress, four main themes have been selected and a number of reports will be submitted on experience in different countries. One theme will be the subject of an international forum discussion.

The reports received will be published in two volumes, one for each meeting. Participants will receive the documentation for the meeting for which they have enrolled in advance of the meeting and in the language of their choice (English, French or German). When each meeting opens, these reports will be "taken as read." A general reporter will summarize the contributions received on each theme and a discussion opener will open the discussion, in which reporters and participants will take part. Simultaneous interpretation into English, French and German will enable participants to speak in any of these languages.

In addition, small groups of participants wishing to hold informal discussions will be given facilities to hold meetings including the use of an interpreter. It is also hoped to show a

number of traffic and safety films during the evening.

Traffic Engineering Study Week

The value of analysing existing traffic when improving a road network is not questioned by any traffic engineer, but the ways of making the analysis are manifold. On the first theme — Traffic Analysis—the reports will concern the principal methods used and the results obtained from censuses and surveys which have been carried out in certain European countries, as well as to the influence new and improved roads have had on the distribution of traffic.

In some countries a great development of two-wheeled traffic has occurred during recent years. Some of the problems which have resulted from this development will be dealt with in theme II—All Purpose Roads and Streets. Questions regarding signs, markings and signals will be discussed in the same theme.

One of the best means to facilitate the efficient use, and at the same time reduce the cost, of road transport is to construct motorways. In theme III —Motorways—special aspects of such roads will be considered, as well as the special signs, markings and signals required for this type of road.

In theme IV — Urban Roads and Streets—questions regarding the capacity of urban roads will be dealt with. The reporters will discuss inter alia the capacity of intersections controlled by traffic signals and the capacity of tunnels and underground passes, as well as the effects which priority rules and other measures (such as one-way streets) have on capacity and journey-time. In the same theme a problem of current interest in all big cities, the control of pedestrian traffic, will be considered.

The reports on theme V—Accident Analyses—will be devoted to the time distribution of accidents.

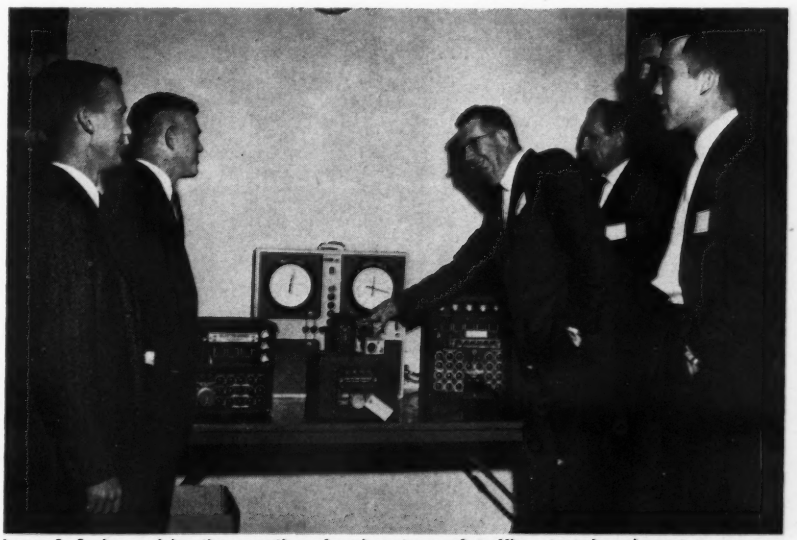
One of the most acute problems confronting the authorities in urban areas is that of parking facilities. Improved conditions can be achieved by the construction of parking garages and the introduction of parking meters. In the last theme — Parking — actual experiences with these two facilities will be given in reports from several countries.

For further information, communicate with World Touring and Automobile Organisation, 32 Chesham Pl., London, S.W. 1, England. Don't forget that travel to such a meeting will represent a business expense and thus may represent a tax deduction in whole or in part.

King Gustaf Adolf, accompanied by Queen Louise, cuts a ribbon to open a new link in Stockholm's subway system. The system now comprises 39 stations and provides facilities for through traffic over a distance of 19 miles, linking the northwestern and southwestern suburbs. Some 5 miles run under ground through congested city area.

Texas Holds Conference On Traffic Safety

Fifty-nine persons representing 25 cities throughout Texas and 12 districts of the Texas Highway Department attended a two-day Conference on Traffic Signals, November 20 and 21, 1957, at A. & M. College of Texas in College Station, Texas. The conference was sponsored jointly by the Department of Civil Engineering and the Texas Transportation Institute at A. & M. College, and the Texas Section of the Institute of Traffic Engineers. The instructional program included the following topics: history of signals, intersection controls, advantages and disadvantages of signals, legal authority, general features of signals, surveys and warrants, explanation of terminology and types of signals, location and visibility of signals, timing and phasing isolated signals, timing coordinated movement, signals on highway routes,



James S. Saylor explains the operation of various types of traffic actuated equipment to a group attending the Traffic Engineering Conference on Traffic Signals held at Texas A & M College on November 20-21, 1957. Shown from left to right: J. D. McIver, Director of Planning & Traffic, City of Grand Prairie; R. H. Schleider, Assistant Professor, A & M College; J. S. Saylor, Senior Traffic Engineer, City of Dallas; Richard P. Abbott, Assistant Traffic Engineer, City of Waco; H. J. Veselka, Planning & Traffic Engineer, City of Arlington, and A. W. Rollins, City Engineer, City of Arlington.

Members of the instructing staff of the Traffic Engineering Conference on Traffic Signals held at Texas A & M College on November 20-21, 1957, discuss demonstration of traffic signal equipment to the conference. Shown from left to right: D. D. Marvel, Senior Traffic Engineer, Texas Highway Department, Houston, Texas; David Fielder, Engineer of Design, City of Houston; Billy Harrison, Assistant Traffic Engineer, City of Fort Worth, and H. E. Hawkins, Engineer of Surveys & Plans, City of Houston.

installation and maintenance, and problems.

The conference was an outcrop of the Traffic Engineering Short Schools of 1956 and 1957 and was offered to bring about concentrated thought and study of one particular subject — in this case traffic signals. It represented still another effort by A. & M. to offer some assistance to those engineers who have had no formal traffic engineering training but who are faced with the problems of solving traffic problems in the smaller towns.

The conference was conducted by the following officials: chairman, Charles J. Keese, associate professor, A. & M. College of Texas; co - chairman, Robert H. Schleider, Jr., assistant professor, A. & M. College of Texas; speakers, David Fielder, engineer of design, Department of Traffic and Transportation, Houston; R. T. Gregory, traffic engineer, Waco; Billy Harrison, Traffic Engineering Department, Fort Worth; Harvey E. Hawkins, engineer of surveys and plans, Houston; R. S. Jolliff, superintendent of traffic signals, Waco; Charles J. Keese; and Jim Saylor, senior traffic engineer, Dallas.

The Texas Section of the Institute of Traffic Engineers cooperates with A. & M. College not only in the in-service training programs but also in the research program of the field of highway and traffic engineering.

Chicago Area Expressways to Have Blacktop Shoulders

A decision to blacktop shoulders on Chicago area expressways has been reached and is reported in *Cook County Highways* for December, 1957. The full story follows:

"Bituminous surfacing will be applied to the shoulders of expressways in Chicago and Cook County as standard practice. The decision to change from the sodded and crushed stone shoulders put down on the first expressway sections has been made by the design committee representing the State, City, County and U. S. Bureau of Public Roads.

"When Edens and Calumet were completed, it was thought that sodded shoulders would be a desirable landscaping feature and would also be adequate to accommodate vehicles when necessary to pull off the pavement. On Congress Street, and in some sections of Edens and Calumet, crushed stone was used as a "stabilized" shoulder.

"In the beginning bituminous was given consideration, but it was feared by some of the agencies represented that a black top shoulder might tempt reckless drivers to use it as a lane for passing. The design committee decided at that time to try out the soft type shoulders both for durability and driver behavior.

"The Cook County Highway Department favored bituminous, and as a contribution to the study installed test shoulders on a part of Lake-Cook Road. The results of this experiment and experience on Edens, Calumet and Congress Street have swung opinion in favor of bituminous.

"As with all other features of expressway design, the main consideration is safety. The black top shoulder is easily recognized as a refuge area in emergencies. It is separated from the expressway lanes by color and also by the slightly rolled curb that marks the boundary of the pavement. The driver who needs to get out of traffic should have no hesitancy in swinging over to the shoulder.

"Experience with sodded shoulders has shown that many drivers do not know that the grassed area is firm enough to support a car or a truck. They either stop on the pavement or pull only half way off.

"Crushed stone shoulders are more inviting to the motorist, but they have failed to stand up under severe weather. The heavy rains of last July washed out shoulders on Congress Street, depreciating their value as emergency refuges and also making it necessary to clean gutters and drains. Furthermore, clogged gutters caused water to stand on the pavement."

(Continued on page 54)

Training Opportunities

February 27-28—10th ANNUAL ILLINOIS TRAFFIC ENGINEERING CONFERENCE—

For further information, address: Professor John E. Baerwald, 401 Civil Engineering Hall, Urbana, Ill.

March 3-21—TRAFFIC ENGINEERING SEMINAR

Sponsored by Northwestern University Traffic Institute and the Midwest Section, ITE. For traffic engineers and others with engineering backgrounds. Tuition $165. For information, address: Northwestern University Traffic Institute, 1704 Judson Ave., Evanston, Ill.

March 17-21 — 3rd ANNUAL SHORT SCHOOL ON TRAFFIC ENGINEERING —

Sponsored by Texas Transportation Institute and CE Department of Texas A&M, Texas Section of ITE, and League of Texas Municipalities. For those concerned with traffic engineering functions of both cities and states. Attendance limited to 40. Contact: Charles J. Keese, Short School Director, % Dept. of Civil Engineering, A&M College of Texas, College Station, Texas.

New Appointments

Leland Appointed Traffic Engineer For Spokane

Elmer J. Leland (Jun. Mem., ITE) has been appointed to head the new Traffic Engineering Division of the Spokane (Wash.) City Plan Commission. His title is City Traffic Engineer. Planning Director for the Commission is Harry F. Aumack (Mem., ITE).

Elmer J. Leland

Leland came to Spokane from Long Beach, where he had been Assistant Traffic Engineer since 1955. A native of the State of Washington, he worked for the Washington Highway Department before going to Long Beach.

A graduate of the University of Washington in C.E., Leland completed the Yale Bureau course in 1954.

Teele Honored By Illuminating Engineering Society

Ray P. Teele (Affil., ITE), of the National Bureau of Standards, was one of ten prominent lighting designers and engineers recently named Fellows of the Illuminating Engineering Society.

The honors, highest degree of membership in the professional organization, were bestowed by the I.E.S. Council upon recommendation of the Board of Fellows which judged a list of candidates nominated by petitions originating among the society's 9,000 members.

Teele, who has been prominent for more than 30 years, is an authority on defense, motor-vehicle and highway lighting and maintenance as well as in photometry. He is a past chairman of the Capital section of the I.E.S., and holds several patents for the development of motor vehicle headlamps and navigational lights.

He is a graduate of the University of Michigan ('27) with a Bachelor of Science degree in electrical engineering, and holds a Master of Science degree from George Washington University ('29).

Havenner Recognized By LA Board of Traffic Commissioners

President Havenner was recognized by the Los Angeles Board of Traffic Commissioners in a recent ceremony when he was presented with a certificate of appreciation signed by the five members of the Commission.

The certificate read as follows:

"WHEREAS, Traffic Engineering is such a vital and essential professional service in the interests of safe, efficient and economical transportation of persons and goods; and

"WHEREAS, Joseph E. Havenner has devoted his entire professional life to fostering good traffic engineering principles and practices;

"WHEREAS, he has now achieved the high honor of election as President of the international Institute of Traffic Engineers comprising some eleven hundred members;

"WHEREAS, for over ten years he has materially aided the City of Los Angeles in organizational studies and in providing unmeasurable counsel and professional assistance to the traffic agencies of the City, and

"WHEREAS, he has wholeheartedly dedicated himself to traffic safety work,

"NOW, THEREFORE, BE IT RESOLVED that the undersigned Board of Traffic Commissioners of the City of Los Angeles gratefully presents this certificate and acknowledges his selfless, energetic contributions to the public interest by his artful and scientific traffic engineering work and leadership, and wishes him long, continued satisfaction and success."

New Publications

Metzger's Table of 45,000 Per Cents
Research Tabulating Bureau, P. O. Box 7, Department 432, Indianapolis 6, Indiana. 1957. 54 pp. $4.00.

This is a table of percentages on the basis of 1 to 300 lines for the numerator and 1 to 300 columns for the denominator. It calculates percentages up to 99.999 per cent.

The table will be of value to researchers, statisticians, estimators, and engineers who must calculate percentages frequently. The table duplicates the function of an expensive desk calculator for such work at a fraction of the cost of the machine. It is chiefly of value to those dealing with samples of 300 or less, of course.

Financing Highways
Tax Institute, Inc., 457 Nassau Street, Princeton, N. J. 1957. 217 pp. $5.00.

The Tax Institute has published a symposium volume exploring the impact of the Federal Aid Highway Act of 1956, the problems it left unsolved, and the new problems it created. Among the symposium participants included in the volume are: Wilfred Owen, Robinson Newcomb, Arthur C. Butler, Frank Bane, Frank W. Herring, Albert J. Wedeking and G. P. St. Clair.

Municipal Law
By Charles S. Rhyne, National Institute of Municipal Law Officers, 839-17th St., N. W., Washington 6, D. C. 1957. 1125 pp. $22.50.

This is the first one-volume handbook on municipal law since 1910. The author, who is general counsel of the National Institute of Municipal Law Officers, is perhaps the most competent man available today to write such a volume.

Included in the volume are chapters dealing with municipal powers and functions; municipal departments; commissions and boards; municipal officers and employees; Federal-city

Promotions

Robert A. Mitchell—to Chief Engineer, Street and Sewer Dept., City of Wilmington, Delaware (was "Acting").

* * *

Elmer A. Clees—to Work Control Engineer, Washington Department of Highways.

Donald E. Bergstrom — to Assistant City Traffic Engineer, Portland, Ore.

* * *

Howard W. Huget—to Assistant County Roadmaster, Multnomah County, Ore.

* * *

S. S. Taylor—to General Manager, Department of Traffic, Los Angeles.

relations; city-state relations; streets, alleys and sidewalks; parking and parking facilities; municipal tort liability; zoning and planning; and many other subjects of interest to city officers.

Convergence Behavior in Disasters

By Charles E. Fritz and J. H. Mathewson, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D. C. 1957. 102 pp. $2.00.

This report of the committee on disaster studies is an analysis of the informal, spontaneous movement of people, messages, and supplies toward disaster areas and toward various points within disaster-related zones, based on a comprehensive review of disaster research findings. The combined effect of personal, informational, and material forms of convergence is shown to constitute a universal problem of social control in the post-disaster period. The report discusses the scope of the various forms of convergence, the types of convergers, the motivational factors in convergence, and various methods and techniques for controlling convergence.

Parking

By Robert H. Burrage and Edward G. Mogren, Eno Foundation for Highway Traffic Control, Saugatuck, Connecticut. 1957. 395 pp.

This volume represents the most recent attempt to summarize the subject of parking. The authors have included material on the parking problem, parking habits and characters, parking needs survey, curb parking, parking meters, off-street parking, lots, garages, and parking on highways. Included also are 5 appendices including specifications for parking meters and a method for a simplified parking study in a small city.

The volume is well illustrated, and should prove of considerable value to those in the field.

Better Transportation for Your City

National Committee on Urban Transportation. Published by Public Administration Service, 1313 E. 60th St., Chicago 37, Ill. 1958, 112 pp., index. $5.00.

This is the basic guide manual prepared by the National Committee on Urban Transportation. It is to be supplemented during the year by some 20 procedure manuals.

This first volume discusses the transportation planning program in terms of six "stages": organizing for the job; getting the transportation facts; defining the problem; developing the transportation plan and the financial program; adopting the preferred plan and financial program; and finally, carrying out the program.

The volume is indexed and illustrated, and is a most important and timely addition to transportation literature.

Florida's new Sunshine State Parkway, now completed for 110 miles from Miami to Fort Pierce, features sign spans by Pfaff & Kendall, New Jersey. The span shown above consists of tapered supports with truss-type span members made entirely of aluminum. The 45-foot span covers two full traffic lanes plus the service shoulders for each lane, and is capable of withstanding even winds of hurricane force. The span itself is a standard P & K design, available in lengths up to 100 feet. Special design spans, 140 feet long, with no middle support, spanning ten full lanes of traffic have already been erected.

cies of highway lumber and timber.

The booklet contains helpful information for experienced highway technical men, and much that will enlarge the working knowledge of younger, less experienced ones. The titles of other booklets on pressure treated wood, available from AWPI are listed, together with the titles, names and addresses of publishers, and prices of technical literature available from other sources.

Copies of the new highway booklet will be sent, without charge, on request to the American Wood Preservers Institute, 111 West Washington Street, Chicago 2, Illinois.

Strictly Business

Union Metal Announces Top Management Changes

The Union Metal Manufacturing Company, Canton, Ohio, announces the election of C. A. Streb as chairman of the board and V. J. Lajeunesse as company president. The change became effective January 1.

Since Mr. Streb became president of Union Metal in 1948, consolidated net sales of the Company have almost doubled and facilities have been expanded to keep pace with the increased demand for such Union Metals products as street and highway lighting poles, foundation piles and material handling containers.

Mr. Lajeunesse, who has been executive vice president since 1954, joined Union Metal in 1939 after serving with the lighting division of General Electric, Schenectady, New York. Mr. Lajeunesse will also continue as president of two of the Company's subsidiaries: The Superior Switchboard & Devices Co., Canton, and The Union Metal Manufacturing Company of Canada, Limited, Brampton, Ontario.

Booklet Available on Treated Wood for Highway Use

"How to Specify and Use Pressure Treated Wood for Highways," is the title of a new, 8-page, illustrated booklet issued by the American Wood Preservers Institute. It presents basic specification requirements for each illustrated major highway use of pressure treated wood. Tables show minimum retentions required for all types of preservatives when used in major spe-

McReynolds Firm Named Eagle Sales Representative

The firm of Traffic Engineers Supply Corporation of Richmond, Virginia, headed by Marshall B. McReynolds has been named by Eagle Signal Cor-

M. B. McReynolds

poration as regional sales representative.

The territory assigned to the McReynolds firm includes both of the Carolinas, Virginia, and all of West Virginia except the panhandle section.

The firm, which is only five years old, is believed the South's largest exclusive distributor of traffic control equipment.

Town and County Striper Introduced By Wald Industries

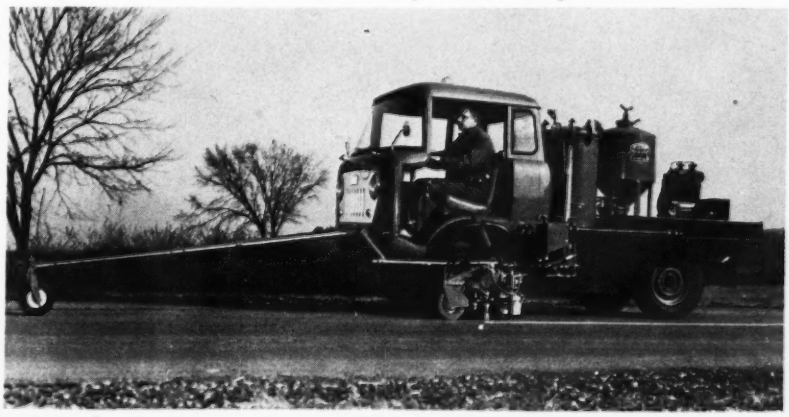
A new pavement striper, truck-built and all-purpose, has been announced by Wald Industries.

This revolutionary striping unit is called the "Town and County," so named because of its versatility and built-in advantages for most any kind of safety marking in cites, suburbs and more outlying regions.

One man only is required to operate the "Town and County." In the cab right at his finger-tips is a push-button control box for automatic patterning of lines and regulation of intermittent advance and retard. Electrically controlled Wald striping guns are within the operator's view at all times, as is also the pre-line pointer.

The "Town and County" striper operates completely within one lane, with an extremely short turning radius for limited area city work and close-to-curb flexibility. With a four-wheel drive on a Jeep chassis it handles as smooth as silk at from 3 to 10 m.p.h. working speeds, controlled by an automatic speed pilot. Quiet and efficient air compression is achieved by an ingenious power take-off mechanism, controlled by the operator.

he "Town and County" is designed for getting on the job fast, and for speedy movement between striping locations. The striping gun assembly lifts out of position pneumatically, the pointer folds back and away you go, up to 60 m.p.h. Other features of Wald's "Town and County" include parallel action gun ride for uniform width stripe, optional three-gun operation and remote line control for specialized work if desired. The new truck-built striper is equipped with Wald air system supply tanks and the exclusive Memosphere system for dropping reflective glass spheres. In fact, the new "Town and County" can handle all types of reflective marking materials, including pre-mixed compounds.



A MECHANICAL METHOD

(Continued from page 14)

quired to go from one leg to the other. With this turning code it was possible to link the parts of the trip which were coded for the expressway route. Finally the adaptability of this procedure to high speed computing and summarizing made possible a tremendous conservation of time.

Comments

The comments that follow deal with the shortcomings of the assignment technique as presented and with suggestions as to how traffic assignment could be improved. There are many shortcomings of this assignment technique. The most obvious is that it does not include assignments to arterial streets. However, vehicle miles of demand remaining after deducting the trips assigned to expressways can be compared to vehicle miles of arterial street capacity. This can be done crudely for each zone.

Another difficulty is that assigned trips can only take a path via expressways or via the one best alternate route. Since trips begin and end any place within their terminal zones, it is obvious that they have many more than two routes to choose from. Whether or not this problem is cancelled out due to the large volume and variety of transfers distributed through the network is not known. It is known that trying to account for all the route paths possibly used would tremendously complicate the problem.

There are two more inadequacies which are problems depending upon how assignment is used. First is that there is no capacity limitation; so a limitless number of trips may be assigned to a facility. The second is that travel time or speed are assumed constant throughout the assignment problem. This is unreal because travel time and speed are a function of volume. The more traffic the greater travel time and less the speed. This presents a problem when assignment is used to determine geometric requirements because the assigned volume often cannot be handled by a reasonable number of expressway lanes. If some feedback arrangement could be worked out where the speed or travel time were related to the volume assigned and adjusted accordingly a more realistic assignment would result. This assignment then would more clearly represent the actual traffic flows and could be used with more confidence in geometric design.

The way traffic assignment is used is very important. If it is used as a route location planning tool, the capacity limitation and quality of service criteria are not needed. Assignment would serve its best use in location planning if it could show how many vehicles would use a route if all trips could be made on the shortest or quickest route and capacity were unlimited. This would show up deficiencies in capacity in the plan and point out needed changes in the plan.

After a plan is finalized capacity limitations should be put back into the system and information "fedback" to adjust speeds or travel times in the network as traffic is assigned to this system. In this manner the system can be tested to see what quality of service is afforded when all trips are assigned to the system.

These problems are being worked on by several groups of researchers. Some day it may be possible to plug values of trip volumes into an "analogue network simulator" and instantly have trips distributed through the transportation network. This type of computer may take years of development but its coming is almost a certainty.

Institute Affairs

BOARD OF DIRECTION MEETS IN WASHINGTON

January 11 and 12, 1958

The Board of Direction of the Institute held a two-day meeting in Washington, January 11 and 12 following the Highway Research Board meeting.

Highlights of the meeting included action on sixty membership cases, adoption of a budget for 1958 of $75,000, and approval of plans for a series of regional conferences or seminars on traffic operations on controlled access facilities (described in an adjoining column).

Specific actions of the Board included the following:

1. Affirmed the report of the tellers that the amendments to the Constitution and By-Laws had been acted upon favorably by the membership, and agreed that cases now before the Board would be acted on in accordance with the new rules.

2. Approved a 1958 budget of approximately $75,000 for the Institute, exclusive of $5,000 in grant - in - aid funds for a series of regional traffic operations conferences.

3. Voted to suspend publication by the Institute of a list of consulting engineers.

4. Heard a report that the Institute seal had been registered in the U. S. Patent Office.

5. Placed three members on the inactive list as authorized by the new By-Laws.

6. Approved the transfer of 20 members to a higher grade and deferred or declined transfer applications of four others.

7. Approved the election of 30 new members (15 juniors, 13 Associates, and 2 Members).

8. Voted to invite two new Affiliates, Ross G. Wilcox of Chicago, and Roy Hauesler of Detroit.

9. Approved a continuation of the present District boundaries.

10. Approved minor changes in the constitutions of the Canadian and Midwest Sections.

11. Approved the suggestion that work be started on a manual for Sections, similar to that currently used by some other organizations.

12. Voted to invite the current list of Sustaining Organizations to serve again and to invite two new groups: Pollak Steel Co. and Charles R. Watts Co.

13. Established a format for the Technical Sessions program at Miami to meet numerous suggestions received by Board members on length of meeting, field trips, etc.

14. Heard of Technical Council action on reports of Committees 2C, 3F, 4D, 4G, 5C and 7A, with publication of several planned after formal Board approval.

15. Received and approved a report from the Steering Committee on Freeway Operations Seminars, reporting on plans for 3 (or 4) seminars to be held this year and 5 or 6 more in the following year.

16. Heard a report on progress on the third edition of the Handbook, with chapter authors largely selected and chapter outlines being started.

17. Voted to participate in the awards program of the 1957 Annual Inventory program (awards in 1958), with awards to be made on a basis to be determined by the next meeting of the Board.

18. Voted to hold the next meeting of the Board in Toronto on May 23 and 24.

FREEWAY TRAFFIC OPERATIONS CONFERENCES PLANNED FOR 1958

A series of regional conferences dealing with traffic operations on freeways has been announced by President Havenner.

"The Institute of Traffic Engineers," Havenner said, "anticipates that as the expanded Federal Highway program gains momentum, there will be a necessity for increased emphasis on operational problems. In those areas where the development of extensive mileage of freeways is already a reality, there is evidence that additional training and research is necessary in the field of traffic operations."

To assist the nation's traffic engineers to meet growing demands in this regard, the Institute of Traffic Engineers proposes to hold a series of two- or three-day conferences on traffic operations geared to the needs of the Interstate Highway System and its urban connections. Three or four conferences are contemplated for 1958, although more conferences might be held the following year if the results justify.

Subject of the conferences will be traffic operations on controlled-access facilities and will include the impact of these facilities on connecting and adjacent systems. The purpose of the conferences is to provide officials directly responsible for traffic operations on these new facilities with additional information and training on the subject. The conferences will be directed primarily to the top technical personnel of city, county, and state organizations who have or will have traffic operations responsibilities related to controlled-access facilities.

The conferences are being planned by a steering committee appointed by President Havenner. Chairman of the committee is Edward G. Wetzel, and committee members include Lloyd M. Braff, J. E. P. Darrell, J. Al Head, Wm. R. Marston, O. K. Normann, Edmund R. Ricker and Wayne N. Volk. Carlton C. Robinson is serving as secretary of the group and ITE Executive Secretary Dave Baldwin is an ex-officio member.

Details of the conferences are now being developed and will be announced as soon as possible. Local sections will undoubtedly be called upon for major help in putting on the conferences. A special grant of funds has been made to the Institute by the Automotive Safety Foundation which will provide ample financial assistance for at least the first year of operation.

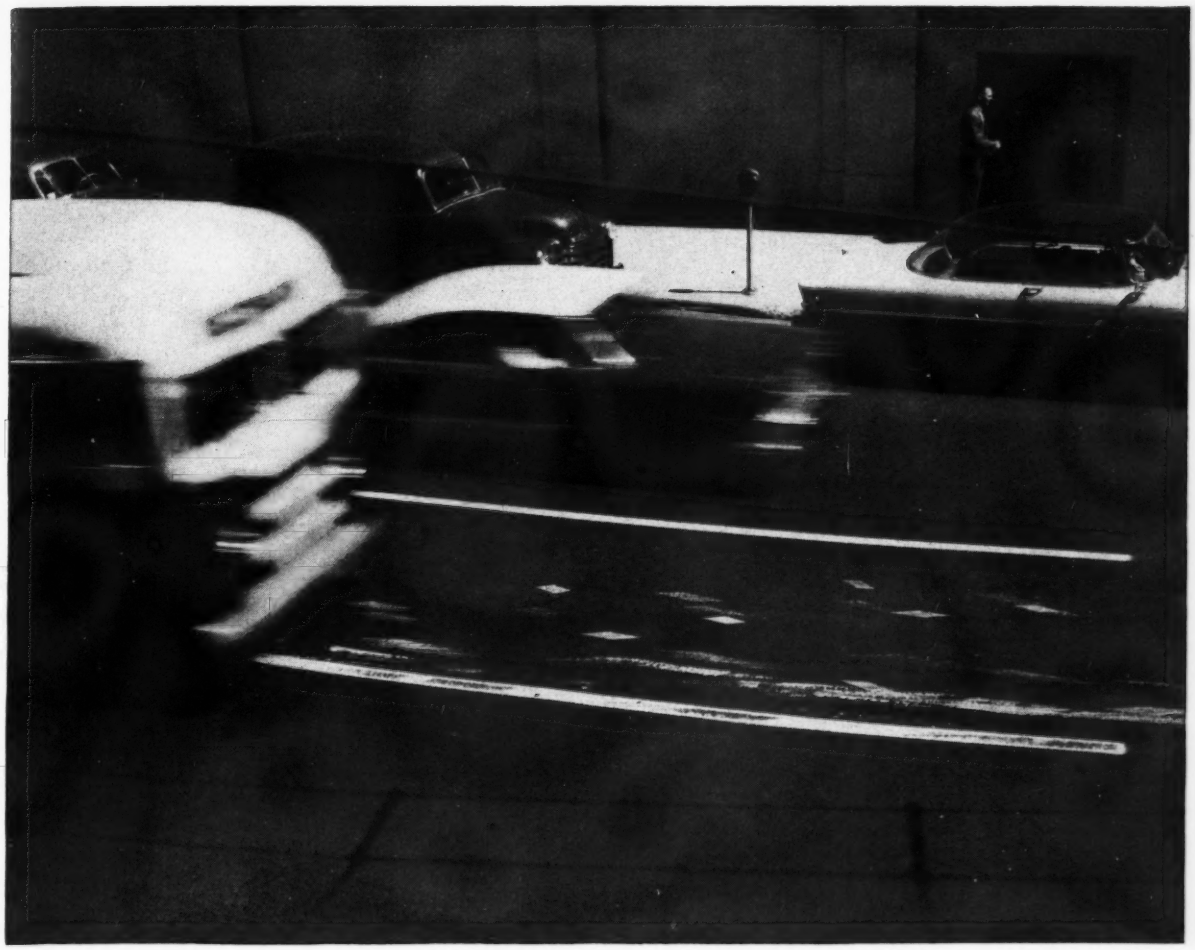
Announcing An
Open Competitive Examination
for

ASS'T GENERAL MANAGER
DEPARTMENT OF TRAFFIC
LOS ANGELES, CALIFORNIA

The Position: No. 2 man and executive officer for a department of 422 employees, including 40 engineers. Offered is permanent civil service status, with annual salary adjustments to match surrounding industrial and professional salary trends. Retirement benefits are provided. Present salary range: $940 to $1170 per month.

The Requirements: A graduate engineer with 5 years experience as head or assistant head of a complete traffic engineering function. An examination will be given, consisting of an evaluation of qualifications and a personal interview.

Action Needed: Request application forms and further details from S. S. (Sam) Taylor, General Manager, Department of Traffic, Room 1000, City Hall, Los Angeles, California
or from
Civil Service Commission
Room 5, City Hall
Los Angeles, California



THIS TRAFFIC PAINT DRIED TOO SLOWLY

...A Parlon-based paint dries FAST!

Here is a typical city street. Its near traffic lane has just been repainted. The striping crew—using modern equipment—laid the line with care and protected it with an adequate number of traffic-control cones. But traffic didn't cooperate. And the paint was slow drying. RESULT: A smeared line; unsightly, unclear, and one that will soon be worn completely away.

MORAL: A good traffic paint *must dry fast*. Formulations based on Parlon® chlorinated rubber *do* dry fast—and they are unexcelled for long-term durability, too. Ask your regular paint supplier, or write us for further information on how the *right* Parlon-based formulation can save you time, money, and headaches.

Cellulose Products Department

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Heavy-duty, weather-resistant signs. Silk-screened legends with maximum visibility, U.S. Dept. of Commerce and States Official Uniform Designs.

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OF ELMIRA, INC.
132 Harrison St. Elmira Heights, N. Y.

Membership Applications

The following applications have been received since the list published in the January issue.

APPLICATIONS FOR TRANSFER

BOWMAN, Benjamin H.
Traffic & Safety Engineer, Ohio Turnpike Commission, 8080 Prospect Road, Berea, Ohio. December 9, 1957 for MEMBER grade.

BRAFF, Wallace R.
Traffic Engineering Associate, Department of Traffic, Room 1000, City Hall, Los Angeles, California. December 17, 1957 for ASSOCIATE grade.

EXNICIOS, John F.
Assistant Traffic Engineer, Room 6W02, City Hall, New Orleans 12, Louisiana. December 13, 1957 for MEMBER grade.

KOCH, Charles W.
Assistant Civil Engineer, Room 251, City Hall, San Francisco 2, California. December 18, 1957 for ASSOCIATE grade.

MACDONALD, William A.
Superintendent of Transportation, Jacksonville Coach Company, 36 Riverside Avenue, Jacksonville, Florida. December 11, 1957 for ASSOCIATE grade.

QUINBY, Henry D., 3rd
Principal Transportation Engineer, Parsons, Brinckerhoff & Macdonald, 51 Broadway, New York 6, New York. December 12, 1957 for ASSOCIATE grade.

RODRIGUEZ, Jorge F.
Civil Engineer, Traffic Bureau, Public Works Department, Stop 22½, Santurce, Puerto Rico. December 18, 1957 for ASSOCIATE grade.

NEW APPLICATIONS

BURAS, Thomas F., Jr.
Civil Engineer II, Traffic Engineering Division, Room 606, City Hall, Omaha, Nebraska. December 26, 1957 for JUNIOR grade.

BUTTZ, Charles W.
Traffic Engineer, Tippetts-Abbett-McCarthy-Stratton, 62 West 47th Street, New York 36, New York. December 5, 1957 for JUNIOR grade.

COOPER, Billy K.
Traffic Engineer, Arkansas State Highway Department, Highway Building, Little Rock, Arkansas. December 5, 1957 for JUNIOR grade.

COWLEY, Roy D.
Assistant Traffic Engineer, B. C. Department of Highways, Victoria, B. C., Canada. December 5, 1957 for ASSOCIATE grade.

GRAMLING, Bruce M.
Assistant Civil Engineer, N. Y C. Department of Traffic, 100 Gold Street, New York 38, New York. December 6, 1957 for JUNIOR grade.

KENDALL, William R.
Transportation Engineer, California Public Utilities Commission, 145 South Spring Street, Los Angeles, California. December 17, 1957 for ASSOCIATE grade.

NEPSUND, Lawrence P.
Traffic Engineering Assistant, Department of Traffic, 14428 Sylvan Street, Van Nuys, California. December 23, 1957 for JUNIOR grade.

SUTERMEISTER, Oscar
Consulting City Planner & Traffic Engineering Consultant, 5923 Johnson Avenue, Bethesda 14, Maryland. December 11, 1957 for ASSOCIATE grade.

TIDWELL, Eugene
Assistant Traffic Engineer, County Highway Department, Court House, San Bernardino, California. December 17, 1957 for ASSOCIATE grade.

TIERNEY, Patrick F.
Assistant Design Engineer, Boston Traffic Department, 112 Southampton Street, Boston, Massachusetts. December 4, 1957 for ASSOCIATE grade.

TRAUTMAN, James F.
Project Engineer, Tippetts-Abbett-McCarthy-Stratton, 62 West 47th Street, New York 36, New York. December 5, 1957 for ASSOCIATE grade.

WILLIAMSON, Jacob F., Jr.
Secretary-Treasurer & General Manager, Southern Signals Inc., 222 Beach Street, Shreveport, Louisiana. January 2, 1958 for ASSOCIATE grade.

WOHL, Martin
Instructor, Transportation Engineering Division, Department of Civil Engineering, Massachusetts Institute of Technology, Room 1-133, Civil Engineering Department, Cambridge, Massachusetts. December 26, 1957 for JUNIOR grade.

New Members and Transfers

TRANSFERS

BAYLEY, John M. (Associate)
Traffic Engineer, Melbourne City Council, Town Hall, Melbourne, Victoria, Australia

CHRONISTER, Joseph S. (Associate)
Traffic Engineer, City of Baton Rouge, P. O. Box 1471, Baton Rouge, Louisiana

CLEARY, Edward F. (Associate)
Assistant Commissioner, Department of Transit & Traffic, 401 East Pratt Street, Baltimore 2, Maryland

COHEN, Jay (Associate)
Traffic Engineer, Office of the Chief of Transportation, Department of the Army, Washington 25, D. C.

CONNER, Robert E. (Associate)
Traffic Engineer, Tippetts-Abbett-McCarthy-Stratton, 62 West 47th Street, New York, New York.

CROMMELIN, Robert W. (Associate)
Traffic Engineer, City of San Leandro, City Hall, San Leandro, California

FLYE, William D. (Associate)
Traffic Engineer, City of Riverside, City Hall, Riverside, California

HALL, Edward M. (Member)
Transportation Research Director, City of San Diego, 256 Civic Center, San Diego 1, California

HUTTER, Jack A. (Member)
Director of Traffic, 17th Floor, City Hall, Kansas City 6, Missouri

KIES, Lee D. (Associate)
Traffic Planning Engineer, D. J. Faustman, Consulting Engineers, 2330 Fruitridge Road, Sacramento 22, California

KISSELEFF, Louis G. (Associate)
Associate Traffic Engineer, Department of Public Works, Room 480, City & County Building, Denver, Colorado

LOGAN, John I. (Associate)
Associate Traffic Engineer, 147 Fountain Street, Providence, Rhode Island

MILLER, C. Harold (Associate)
Traffic Engineer, Traffic Engineering Department, Room 411, City Hall, Tulsa, Oklahoma

O'CONNOR, David J. (Associate)
Engineer III, Wisconsin State Highway Commission, State Office Building, Madison, Wisconsin

RIGOTTI, Robert A. (Associate)
Traffic Sign Engineer, Michigan State Highway Department, Stevens T. Mason Building, Lansing, Michigan

ROSS, Lewis J. (Associate)
Chief Design Engineer, Idaho Department of Highways, P. O. Box 879, Boise, Idaho

SOSMAN, Edward C. (Associate)
Traffic Engineer, Ramp Consulting Services, Inc., 230 Park Avenue, New York, New York

STEWART, William A. (Associate)
Chief Municipal Engineer, A. D. Margison & Associates Ltd., 30 Eglinton Avenue East, Toronto, Ontario, Canada

THOMPSON, Lawrence E. (Associate)
Traffic Civil Engineer, Arizona State Highway Department, Phoenix, Arizona

WANTOCH, Henry J. (Associate)
Traffic Engineer IV, Bureau of Traffic Engineering, Room 804, City Hall, Milwaukee, Wisconsin

NEW MEMBERS

BAILEY, Robert (Junior)
Traffic Engineer, Traffic Engineering Department, Calgary, Alberta, Canada

BAKER, Samuel T., Jr. (Associate)
Assistant Traffic Engineer, Bureau of Traffic Engineering, 900 East Broad Street, Richmond, Virginia

BATES, Thomas I., Jr. (Associate)
District Traffic & Planning Engineer, Florida State Road Department, Box 591, Bartow, Florida

BEACH, Frank C. (Junior)
Assistant Planning Engineer, Wayne County Road Commission, 7th Floor, City-County Building, Detroit, Michigan

BERRY, Walter R. (Member)
District Traffic Engineer, Illinois Division of Highways, 126 East Ash Street, Springfield, Illinois

BREUNING, Siegfried M. (Junior)
Assistant Professor of Civil Engineering, University of Alberta, Edmonton, Alberta, Canada

DUQUE VILLARREAL, Tomas G. (Junior)
Inspector-Engineer, Public Works Department, Tecnica de CAM, Panama, Rep. de Panama

FREEMAN, Robert L. (Junior)
Assistant District Traffic & Planning Engineer, District 1, Florida State Road Department, Bartow, Florida

GARZA, Paul, Jr. (Junior)
Planning & Traffic Engineer, City Planning Commission, City Hall, Laredo, Texas

HAEUSLER, Roy (Affiliate)
Automotive Safety Engineer, Chrysler Corporation, 14870 Grandville Street, Detroit 23, Michigan

HAMILTON, Ralph D. (Junior)
Highway Designer II, Idaho Department of Highways, 603 Main Street, Boise, Idaho

HEINEMAN, Paul L. (Associate)
Principal Assistant Engineer, Howard, Needles, Tammen & Bergendoff, 1805 Grand Avenue, Kansas City, Missouri

ISRAEL, Rudolph J. (Member)
Assistant Traffic Engineer, California Division of Highways, Box 1499, Sacramento, California

KAISER, John M. (Junior)
Assistant Civil Engineer, N. Y. C. Department of Traffic, 100 Gold Street, New York 38, New York

KEIFER, Kenneth G. (Associate)
Partner — Highway Design Engineer, Fenton G. Keyes Associates, 202 Washington Street, Providence, Rhode Island

KOLIN, Jakob (Associate)
Partner, Kolin & Zahavi, 4 Herzl Street, Tel-Aviv, Israel

LEWIS, Brian J. (Junior)
Traffic & Transportation Engineer, Porter, Urquhart, McCreary & O'Brien, 568 White-Henry-Stuart Building, Seattle, Washington

MORAWSKI, Teddy J. (Associate)
Programming & Planning Engineer, U. S. Bureau of Public Roads, Room 701, Pennsylvania Building, Washington, D. C.

ORER, Mete (Junior)
Urban Traffic Engineer, General Directorate of Highways, Ankara, Turkey

PETERSEN, Stephen G. (Junior)
Senior Traffic Engineer, N. J. Bureau of Traffic Safety, 32 East Hanover Street, Trenton, New Jersey

PLATT, Mathew (Associate)
Traffic Engineer, Michael Baker, Jr. Inc., Baker Building, Rochester, Pennsylvania

PRIETO-URDAZ, Alberto (Junior)
Civil Engineer, Department of Public Works, Traffic Bureau, San Juan, Puerto Rico

RESTREPO MALDONADO, Fernando (Junior)
National Chief of Traffic, Ministry of Fomento, Bogota, Colombia, South America

RHUDY, Harold C. (Associate)
Associate Traffic Engineer, N. C. State Highway Commission, Raleigh, North Carolina

RICHTER, Jacques (Junior)
Traffic Engineer, Wilbur Smith & Associates, 495 Orange Street, New Haven, Connecticut

SAWYER, Frederick J. (Associate)
Associate, Head of Report Department, Parsons, Brinckerhoff, Hall & Macdonald, 51 Broadway, New York 6, New York

SCHEMPERS, William, Jr. (Junior)
Junior Civil Engineer (Traffic), Room 259, Civic Center, San Diego 1, California

WARD, William A. (Associate)
Associate Traffic Engineer, N. C. State Highway Commission, Raleigh, North Carolina

WILCOX, Ross G. (Affiliate)
Highway Engineer, Portland Cement Association, 33 West Grand Avenue, Chicago, Illinois

YOUNG, William T. (Associate)
Assistant Traffic & Planning Engineer, S. C. State Highway Department, Columbia, South Carolina

ZAHAVI, Yacov (Associate)
Partner, Kolin & Zahavi, 4 Herzl Street, Tel-Aviv, Israel

Section News

Section Meetings

CANADIAN:

May 22-25, Toronto. Contact: Grant A. Bacchus, 179 Tavistock Rd., Downsview, Ont.

INDIANA:

Monthly meetings on second Tuesday. Contact: Frank Vukovits, South Bend, Central 3-5111, or Ted Siegel, Indianapolis, Melrose 4-3311, Ext. 341.

MIDWEST:

Monthly meetings, third Thursday, except January, July, August and October. Contact: Gordon G. Lindquist, Franklin 2-1818.

NEW YORK METROPOLITAN:

Feb. 6, March 20 (Ladies Night), April 17, May 22. Contact: Gordon K. Gravelle, 100 Gold St., DIgby 9-0090 for place and time.

NEW ENGLAND:

In conjunction with Massachusetts Safety Council, Boston, on March 17. Contact: M. J. Huber, Yale Bureau of Highway Traffic, New Haven, Conn.

SOUTHERN:

Next meeting in Memphis, Tenn., during Southern Safety Conference, March 2, 3 and 4, 1958.

WASHINGTON (D.C.):

Luncheon meeting, Feb. 10, All States Dining Room.

Dinner meeting, April 2 (tentative), Baltimore. Contact: Mason Butcher, Director of Public Works, Montgomery Co., Rockville, Md.

WESTERN:

Los Angeles Area—Monthly workshop and dinner meetings at L.A. Police Academy Feb. 25, March 25, and April 22. Ladies night, May 27.

Sacramento Area—Monthly luncheon meetings on first Monday.

INDIANA SECTION

The Indiana Section held its Winter Quarterly Meeting in Indianapolis on Tuesday, December 3, 1957 at the Fireside Restaurant. A total of 39 members and guests were in attendance.

Following the dinner President *William H. Bilby* introduced the new section affiliates and guests for the evening to the group. *Ted Siegel*, program chairman, then introduced the guest speaker of the evening, Mr. George Foster, executive director, State Highway Department of Indiana.

Mr. Foster explained to the members how their work was necessary to the growth and expansion of the national highway system, both in cities and in rural areas. He brought out the many phases of planning, studies and headaches which confront the traffic engineers, but which must be overcome to help the driving public from increasing the accident rate of the nation. Mr. Foster brought to the attention of the group the many topics which were discussed by the Committee on Traffic at the American Association of State Highway Officials meeting in Chicago a short time ago.

The business session was opened by President *Bilby* who explained to the group the various types of memberships in the Indiana Section. He also stressed the point that the Indiana Section members who are not members of the ITE should make every effort to join if they are eligible. He felt that there were many in the Indiana Section who could qualify for membership in the ITE. Along with membership in the ITE these same members would then have the right to vote and hold office in the Section, thereby making it a better Section all the way around.

The results of the voting for officers for 1958 were announced. All incumbent officers were re-elected for another year. These are President, *Wm. H. Bilby*; 1st Vice-President, *James A. Cox*; 2nd Vice-President, *Stanley T. Siegel*; Secretary-Treasurer, *Frank S. Vukovits*.

The group was informed that the Board of Directors had received six requests for sustaining membership in the organization and had approved the requests. The following organizations and their representatives were approved: James H. Drew Corporation, represented by Wm. K. Drew; Wayne Hall Sign & Post Co., represented by Wayne Hall; Minnesota Mining & Mfg. Co., represented by Ed. Comstock; Herb Williams & Sons, Inc., represented by Robert C. Williams; Lilly Paint Products Inc., represented by Russell Elliott; and the Watson-Flagg Electric Co., Inc. represented by Matthew J. Dennin.

Program Chairman *Ted Siegel* announced that the Section would hold meetings in 1958 on the second Tuesday of each month. *Clint Venable* and *John Dennin* were appointed as members of the Program Committee to assist in planning the future meetings. The membership was asked in turn to make suggestions as to the type of programs desired, theme of program and speakers that they would like to have for the Annual Purdue Road School scheduled for April 7-10, 1958.

Spring being just around the corner—everyone was reminded to start making plans for a bigger and better Tri-State Meeting to be held in the late spring. The meeting was closed at 9:30 P.M. and all members departed for their respective homes—except Secretary *Vukovits* who had the misfortune to break off the ignition key in his car door lock previous to the meeting and with no spare on hand. It was a cold, wintery night in Indianapolis for the Secretary of the Indiana Section!

CANADIAN SECTION

News Briefs

Toronto—The Central Area Group of the Canadian Section held a dinner meeting on November 14th last at which 70 persons were present. Mr. J. E. Liesch of DeLeuw Cather and Co. paid a return visit and delivered a very informative paper on interchange design. Reports were also re-

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is a simple, sturdy, time-tested device for traffic counting. It is pneumatically actuated by means of the road tube attachment.

Traffic volume is easily read on direct reading counter. Can be rapidly installed anywhere. Rugged construction; will last for years.

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ceived about the Detroit Convention (ITE) and the Saskatoon meeting of the C.G.R.A.

Progress Report on Parking in Windsor, Ontario, by *E. S. Wiley*, Director, Traffic Engineering Department.

The Corporation of the City of Windsor in 1954, through enabling legislation, earmarked all parking meter revenues for off street parking purposes. Our average gross meter revenue is something approaching $200,000. per annum.

Early in the year 1957, as the result of factual study, 12 sites were selected as potential off street parking sites, selected of course strategically enough, that they could be eventually used for multi-level parking.

A total of $700,000 was appropriated for the acquisition of properties $200,000 of which was paid out of current meter revenues, and the balance by means of short term bank loans.

Several residential properties (adjacent to commercial areas) were involved, and in each instance, after the expropriation of the property, the tenant or owner was given the privilege of moving his house at his own expense to some other area.

The properties acquired were demolished, graded and surfaced and equipped with 6" curbing all around the perimeter, and finished off with 3 foot chain link fence. The areas between the sidewalk, and the parking lot curbing have been embellished with sod, producing a fairly attractive parking site.

In areas, where the lot lies between residential and commercial areas, a 20 foot front yard, and a 4 foot side yard was required. While this reduces in some instances the number of potential stalls, it does blend well with the abutting residential areas, and kept objections to a minimum.

The 12 sites produced a total of 642 stalls, some of which are controlled by parking meters and parking gates. Our estimated cost per stall for acquisition, and improvement, is in the neighbourhood of $1,300. With a potential revenue, including both street meters and off street lots of $300,000. per year, it is reasonable to assume that the total debt can be retired in very short order.

At the moment, we are in the process of investigating other sites, which could conceivably produce another 100, or possibly 150 spaces.

The creation of off street lots is serving a twofold purpose. Two years ago, after representation to City Council, they adopted firm policy of removing curb parking in the downtown core, on the ratio of 3 to 1, for every three spaces created off the street, one space is removed at the curb. Our present scheme, is to remove curb parking from the perimeter of newly created lots.

Existing trends indicate, that the creation of 200 additional spaces, will keep us abreast of our current demand. We intend to pursue this theory, by reason of being convinced as an individual, that this is the only means of freeing our streets, of the cluttered up mess in which we find them.

Before and After Study of Three Installations of Winko-Matic School Signals

The following are the results of a study made by the Metropolitan Toronto Traffic Engineering Department at three locations where Winko-Matic School Signals were installed. It will be noted that a considerable reduction in average speeds at each location was accomplished. The normal speed limit at all locations is 30 m.p.h. and the indicated speed on the Winko-Matic signal is 25 m.p.h.

LOCATION	DATE SCHOOL WINKO-MATICS INSTALLED	AVERAGE SPEEDS IN M.P.H. Before Instal.	After Instal.
Keele St. — Clearview Hts. (C. E. Webster School)	Sept. 1/56	36.6	25.7
Bathurst St. — Ava Rd.	Apr. 30/57	34.2	27
Dixon Rd. — Kipling Ave.	May 27/57	37.4	31.3

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All Type LF Controllers have provision for three dial-units regardless of the number of units originally purchased. They are available with 1, 2, or 3 resets on each dial-unit. When shipped from the factory, all controllers are wired for 3 resets. Resets 2 and 3 may be purchased originally or added at any time simply by installing dial contacts and switch arms.

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Mike Gittens expounds at a demonstration in one of Pittsburgh's TV stations held at the time of a recent Mid-Atlantic Section meeting.

MID-ATLANTIC SECTION

The Board of Directors meeting scheduled for December 4, 1957, ran into a conflict of dates. That was also the date winter weather arrived in Pennsylvania, and two of our Directors were too busy in their respective cities of Philadelphia and Pittsburgh directing traffic through the snow to do any other directing.

The Delaware delegation at the annual meeting reported that they had a fine time, but hoped that they were better at handling highway traffic than they were at railroad traffic. In fact, we understand that *Bill Carrow* is thinking about taking lessons from his son when the latter gets his trains set up at Christmas.

Dave Wooster took a lot more than traffic engineering experience out of New Haven when he moved to Pittsburgh several months ago. While in New Haven, he not only learned to eat Italian foods, but also became quite proficient in the preparation of the same. The City of Pittsburgh Traffic Planning Division had a sample of his "Melengana Alla Parmigiano" one day at the office. For those of you whose education is incomplete, that means eggplant cooked in hot tomato sauce. The only thing missing was the wine.

December 9, 1957, was "V" day in the City of Pittsburgh when the trolley strike was ended after 54 days. No one was happier than the Police Department, *Mike Gittens*, and his staff.

Another 'Thank you' to "Joe Prismo" for being such a wonderful host at the last section meeting comes from *Tony Miscimarro's* two-year old son, Philip. Tony reports that he doesn't know who enjoys the corn cob pipe the most; Philip during the day or Tony during the evening. Quoting Tony, "There is never a blight in its light." Apparently no soap bubbles either!

NEW ENGLAND SECTION

The second meeting of the 1957-1958 season was held at Hamden, Connecticut on December 4, 1957. There were forty-four members and guests present.

The meeting was called to order by President *Chandler*, followed by the reading of the minutes of the previous meeting and the Treasurer's report.

The meeting was then turned over to *Bill McGrath*, local arrangements chairman. Bill introduced the guest speaker, Edward J. Logue, Development Administrator, City of New Haven. Mr. Logue first outlined the administrative environment in which the particular functions of the Redevelopment Agency, the City Plan Commission and the Department of Traffic and Parking are coordinated in preparing a working plan for New Haven. The speaker emphasized the inseparability of urban renewal and highway planning.

Mr. Logue outlined the projects currently underway in the City of New Haven, with special reference to the Connecticut Turnpike, the Oak Street Connecter, relocation of Route Five and the Church Street Redevelopment project.

After a most spirited discussion period, the meeting was adjourned by President *Chandler*.

TEXAS SECTION

Dallas-Fort Worth Toll Road

Undoubtedly TEXites are interested in operations on the toll road between Fort Worth and Dallas. Hence we give you an up-to-date report from our genial friend, Mr. Jack Davis, Engineer of Maintenance and operations, Texas Turnpike Authority.

"The average daily traffic for the month of September was 13,059 vehicles per day. This was our first full month of operation. As you know, the Turnpike was opened to traffic on the morning of August 27. The average daily traffic for the month of October totaled 13,605 vehicles per day. The highest single day's traffic was on October 19, when we had 24,586 vehicles.

"Coverdale and Colpitts who made the traffic and revenue report on the Dallas-Fort Worth Turnpike, estimate that at the end of the first years operation we should expect 30,000 vehicle trips per day. This estimate was based on the premise that our connections at the Dallas and Fort Worth ends would be completed. As you know, neither of these connections have been 100 per cent completed. It is expected that completion of the connections is about twelve months away. Inasmuch as we do not yet have enough operation experience to accurately forecast what our first year's traffic should be, we can only use the estimate as prepared by Coverdale and Colpitts.

"In order to meet our present operating costs we need 5,600 vehicles per day. In order to meet operating costs and interest costs we need 16,000 per day. As you can see, with our October average daily traffic of 13,605 vehicles, we are approaching the point where we can meet operating costs and interest costs. This is considered very satisfactory insofar as operating a new turnpike is concerned.

"We are very proud of our accident record to date. Just this morning (Nov. 8) the 1,000,000th vehicle entered the turnpike since opening day August 27. Approximately 23,000,000 miles have been traveled on the Turnpike without a single fatal accident. Moreover, there have been only two accidents requiring hospitalization and both of them were very minor injuries. Through the month of October we have had a total of 22 accidents of all kinds. Most of these 22 accidents were minor, several of them with less than $25.00 property damage.

"Continuous roadway lighting extends from our terminal connection in Fort Worth easterly to a point just east of the Fort Worth terminal toll station. Likewise, on the Dallas end, extending westerly to a point just beyond the terminal toll station. In addition, each intermediate interchange is completely lighted and both service areas, including the parking lots are lighted."

WESTERN SECTION

Inter-Mountain Area

From the State of Montana at Helena comes the news that they have recently added to their professional staff a full time electrical engineer, *Mr. Leslie Clark. Mr. Clark* is handling their street lighting signal programs which are just getting underway. They now have a staff of four professional engineers and, of course, are looking for more like everybody else.

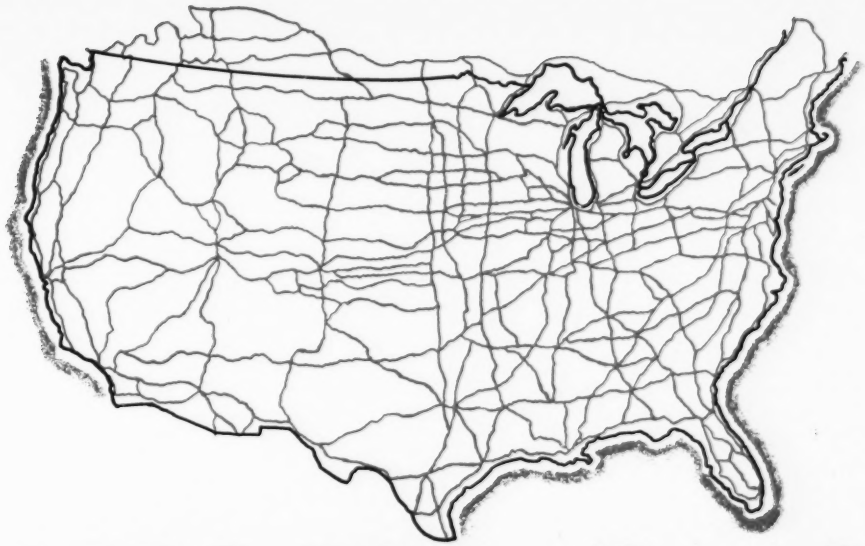
Jake Landon and *Bill Sheffield* from MMM gave a nice party and demonstration of some aspects of the interstate signing for members of the Highway Commission and their staff September 25. On September 26 *Maurice RiChey* flew to Seattle to attend the meeting of the AASHO Committee on design. While in Seattle he talked with *Bob Dunn* for a few minutes. Maurice says Bob's hospitality was excellent.

The State has just let its first major signal contract, amounting to approximately $24,000, in the City of Great Falls. Two intersections were signalized, one with a semi-traffic actuated controller and one with a two-phase volume density controller. "It will be interesting to watch and tinker with the controller when the installation is complete," says our correspondent. These are the first two installations of this type in the state.

The City of Great Falls has a new Traffic Engineer, *Harvey Read*, who after six months on the job has one one-way couplet to his credit to date and maybe more coming.

Maurice RiChey reports that inasmuch as he is the only ITE member in Montana, he usually holds a monthly meeting with himself—which should be very interesting. He and *Bob O'Connell* should get together inasmuch as, at the present time, Bob is the only ITE member in the State of Wyoming.

On November 3, 1957, Boise, Idaho converted its entire downtown area into one-way. All reports indicate that it is working very well and the City officials are highly pleased. *Al Mathews* flew from Seattle for the occasion. It is reported that Al disappeared for a short time and had lost his way in the large one-way network.



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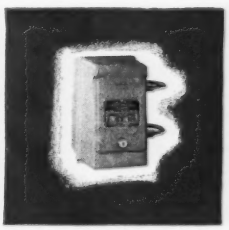
Duncan-Miller Duplex ®

Duncan-Miller Model "50" ®



Duncan Fine-O-Meter ®

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Los Angeles Area

The City of Los Angeles is now operating the traffic signals in the area surrounding the Los Angeles Memorial Coliseum by radio control. This project has been carefully coordinated with the Police Department and has been under the direction of *Bob Warr*, Traffic Engineer, Department of Traffic, City of Los Angeles. Bob says they will never replace street cars.

Oregon Area

The Oregon Area held a dinner meeting on the evening of October 25, 1957, at the 3-Star Restaurant in Portland. About 29 members and guests were in attendance. Highlighting the evening were reports on the National Convention by *Al Head* and *Don* (where was he at the Annual Banquet?) *Bergstrom*. Following this fun fest, Al Head asked for and received several suggestions on ways and means of conducting the 11th Annual Northwest Traffic Engineering Conference which is scheduled for January 22-24 at Corvallis. Those in attendance signed a cocktail menu postcard for presentation to *Bill Weller* who was unable to attend the meeting due to illness.

The Portland Bureau of Traffic Engineering will install 350 parking meters in the Hollywood business district, which will begin operation on November 18th. This is the first meter installation for the City of Portland outside the metropolitan business district. The meters will be of the double-head variety, which is also new to the City. In the Hollywood district the length of the parking space is being extended to 22 feet bumper to bumper style, whereby the spaces will be marked for 19 feet, leaving a six-foot area for maneuvering between groups of two cars which are bumper to bumper.

Val Johnson and *Bud George* are busy planning future illumination and signal projects involving the Interstate System. Currently underway are several lighting contracts involving interchange illumination on the Interstate System. These contracts have a new concept whereby both fluorescent and mercury vapor lights are used depending on the location within the interchange to be illuminated. *Val* is also in the process of extending a special comparative study on different types of actuated signal control.

Washington Area

It seems that *"Squeeg" Glaze's* men could not keep up with their work in the Planning Division and they had to call in three of *Rex Still's* boys to help get them out of the hole they were in. *John Chaffee, Bill Kingman* and *Tom McLeod* were called on to do the honors. Whether they got them out of the hole or not, they must have learned some of the mystifying secrets of benefit analyses and forecasting traffic usage of proposed new facilities. Rumors are that the next time Planning finds itself in this position, *Rex* himself will be the one to be tabbed. It seems he can be spared more easily than his boys!

Sacramento Area

Sacramento, Queen City of Superior California,* is agog with anticipation of the Western Section meeting next June. As previously reported, three new hotels are under construction, the roof decks on the ample, reasonably priced parking lots are being repaired, and everything will be in readiness.

*The word "superior" in this context is Spanish and means "northern," i.e., superior on a map when the north arrow points up. It does not mean that California is superior to other states. By a coincidence, Southern California is inferior, again if the north arrow points up. Although the Sacramento Bee prefers the Spanish designation, it has not been called to our attention that the San Diego and Los Angeles papers refer to their section as Inferior.

The Convention Committee is in full swing. Bids for speakers will be going out in the near future, and it is hoped that readers will respond when called. But don't wait to be called if you have something really important to get off your chest.

The Sacramento City Traffic Engineering Department, after many years of cramped quarters in the City Hall, has moved to the recently acquired annex at 817 10th Street. *Dudley* says that it is nice to have enough space to breathe, but he has lost some of the protection (an antiquated elevator, two flights of stairs, a maze of doors, the files, and the building inspectors) from irritated citizens. His new office has a sidewalk entrance and is bounded on three sides by one of the City's parking garages. How much more accessible can he get.

Jack Faustman and Company have found one-way streets to be a solution to some of the traffic problems in San Bernardino, San Luis Obispo, and Santa Rosa. It looks as though *Jack* has his work spread all over the state. With all the traveling, maybe he should buy a share in United Air Lines.

Bay Area

Thirty-eight Bay Area ITE's and guests gathered at Spengers in Berkeley for a dinner meeting on November 6. An enjoyable time was had by all in spite of grumbles from the distinguished (?) gate crasher *Skinny DeYoung*, about being fed roast beef at a seafood restaurant. Professor Harry Mathewson from the ITTE at U.C.L.A. was the featured speaker and presented a summary of the research work being conducted at U.C.L.A., an insight into the future developments of the automobile, and comments and a film concerning crash injury studies. The viewers were very much impressed with the slow motion pictures of two vehicles crashing head-on at 50 mph.

San Francisco's trial "de-scramblization" of Montgomery Street went into effect October 2. The first few days required some police supervision during heavy pedestrian periods, but most people accepted the change without too much difficulty. There is still some agitation against the removal of the scramble system which is not having very much success. *Ross Shoaf* also instituted a number of new one-way streets in the past few weeks.

Jim Kell's extension course, Fundamentals of Traffic Engineering (Tuesday evenings in San Francisco), is underway with 19 students enrolled. Four cities, seven consultants, and the P.G. & E. are represented, in addition to two men from Division of Highways and five men from the 537th Engineering Company of the Army. This is the largest enrollment for this course in the last several years.

Bob Crommelin reports that several Bay cities are experimenting with plastic marking for crosswalks. Trial installations will be made and compared with painted crosswalks.

San Diego Area

The City of San Diego, Traffic Engineering Division, just recently completed the field work for a Parking Usage Study in a 174 block area of the Central Traffic District. The study was supervised by *Stephen George* of the Transportation Research staff. *Steve* reports that as of August 1957, the City had 6610 parking meters in operation.

Chuck Strong of the California Division of Highways reports that the District II Traffic Department has been growing by leaps and bounds recently. At present the department consists of Dick Chaney as District Traffic Engineer, Bill Calland as Dick's assistant, plus 2 associate highway engineers, 5 assistant highway engineers, 1 assistant electrical engineer, 3 junior civil engineers, 4 engineering aides, and 2 stenographers, 19 people in all. Five of the engineers spend all of their time on O & D studies and future traffic estimate work. This is a far cry from the 5 man, 1 woman department of 4 years ago.

Ed Hall reports that the Advance Transportation Planning Team of the San Diego Metropolitan Area Transportation Study has completed the estimate of the future origins to be generated by a population of 2.3 million. These estimates were based on traffic generating studies and on land use and population projections developed by the City and County Planning Departments. The estimate of auto-truck origins for each of the 234 traffic assignment zones were developed by seven basic land uses. This information is now being processed in order to develop a triangular table for assignment to Study Plan of Freeways, Expressways, Major Streets and Highways. *Keith Gilbert* and *Steve George* participated in this project.

On Friday, November 22, 1957, a very successful area dinner meeting was held at the colorful Cafe del Rey Moro in Balboa Park. Social Hour Host was Dean Irons of Minnesota Mining and Manufacturing Company. The meeting and social hour was enjoyed by 54 members and guests, some of whom came all the way from Los Angeles, Orange and Riverside. Guest speaker was Hamilton Marston, prominent San Diego department store manager and stockholder, whose interesting and informative subject was "Aspects of Merchandising as They Pertain to Growth, Parking Demands, and De-Centralization of San Diego." As an added attraction *Paul Fowler* showed some excellent slides of his recent trip to the Canadian Rockies, Yukon and Alaska.

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The Institute is considering the possibility of offering a binder (imitation leather, no holes to punch, stamped in gold) to hold 12 issues of **Traffic Engineering**, at a cost of about $2.50 each.

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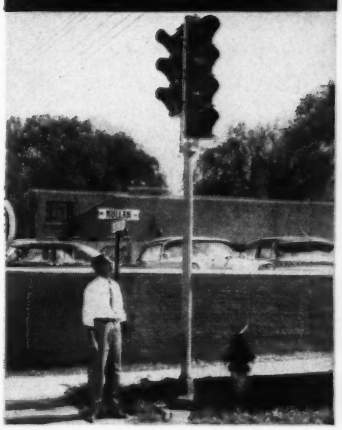

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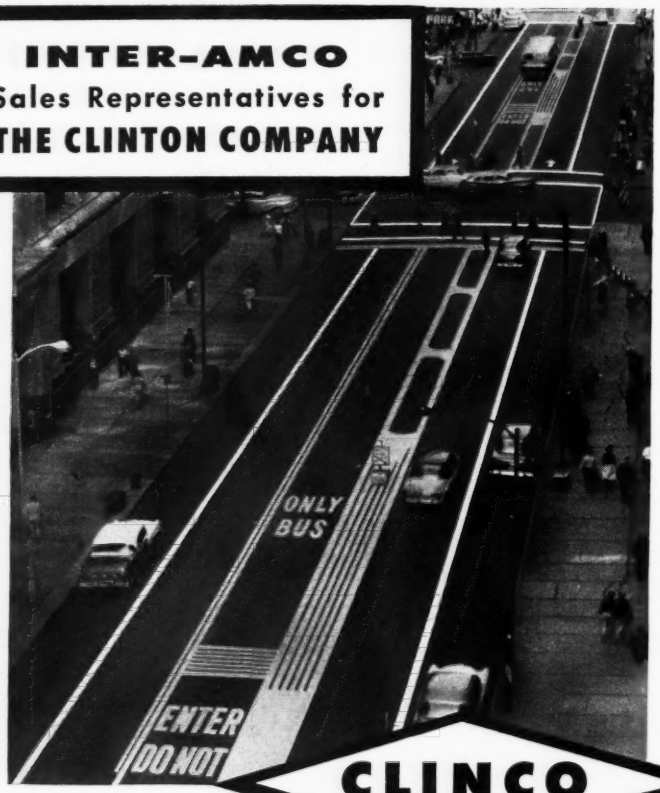

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RESIDENCES AND FREEWAYS

(Continued from page 22)

homes where there is uniformity of prices.

3. "Financing" has become so important in the marketing of residential property that it is singularly capable of influencing the market value. Where equal financing is available, the freeway has no influence upon the marketability of residential property; however, where individual refinancing of a home is subjected to prejudicial influence by a lending institution, it follows that it will have a direct influence upon the marketability of that property.

4. Resale statistics reveal that residences adjoining a freeway can attain a higher price range than comparable residences; however, this occurred only among those residences located the greatest distance from the right of way fence and freeway traffic.

The majority of homesites in this state-wide study were located below the grade of the adjoining freeways, and the trend in market value of these residences was not adversely affected by extreme differences in the height of the freeway embankment.

5. At the present time, nearly all residences adjoining California freeways are within tract developments. There is ample evidence that pride of home ownership is as strong among residents living alongside freeways as exists among the owners of comparable homes.

The general concept that people create value has been reaffirmed in this residential study. The buyers and sellers participating freely, and with full knowledge of the current real estate market, have expressed through actual transactions, acceptance of a freeway alongside their homesites, with only a slight depreciation in marketability for the house adjoining the freeway.

A TRAFFIC ROTARY

(Continued from page 25)

overhead and side-of-road, it was possible to direct traffic on the approaches into their proper lanes, thus eliminating practically all weaving maneuvers within the old circle area.

The successful redesign and signalization of Leverett Circle was based on the following factors:

1. Separation of diverse traffic movements where possible.

2. Proper signing to accomplish necessary weaving in the proper location, that is, on the approaches where weaving may be accomplished with maximum safety and minimum impedance to orderly traffic flow.

3. The proper control of traffic by means of signals and alignment to provide for progressive movement.

Final reconstruction plans for Leverett Circle were completed on May 1, 1956 with the bid opening, award of contract and construction following in rapid sequence. On September 6, 1956 the Metropolitan District Commission accepted the job and the new signal system has been in successful operation since that date.

Leverett Circle is currently operating on a 60-second cycle which provides for a minimum of delay on any approach and is sufficient to handle current volumes.

The table shown on page 48 indicates the traffic volume buildup which has been experienced at Leverett Circle.

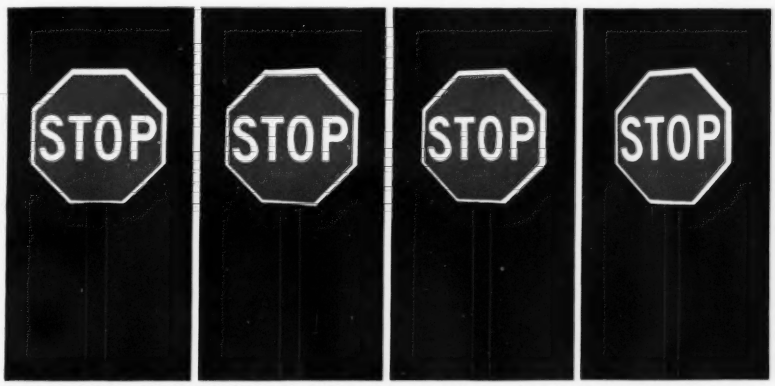
If traffic continues to build up, and we predict it will, this area will probably require a longer cycle length with slightly longer delay for those stopped, but with fewer stops per hour. With fewer stops per hour, more time will be devoted to actual movement and less time required for resuming speed

What characteristics should an effective traffic sign possess?

Broadly speaking, the answer to this question lies in investigation of 4 vital factors. As you may guess, the first of these is performance, far and away the most obvious sign feature to motorists. And, after this come the equally important economic considerations of sign fabrication cost, installation and maintenance ease, and durability, or useful length of life. Let's look at each more closely.

Performance

A motorist on the road after dark needs the help of traffic signs even *more* than a daylight driver. Accident statistics bear this out. With growing traffic volume—20,000,000 vehicles on the road after dark—the need for modern 24-hours-a-day signing cannot be denied. Whether the sign is a 24″ x 24″ curve warning or an 8′ x 10′ guide panel, *reflectivity* is a characteristic an effective sign must possess.



A sign of "Scotchlite" Reflective Sheeting performs without serious loss of brilliance through typical entrance angles of 0, 10, 20 and 30 degrees. Wide angle optical characteristics help compensate for road curvatures, installation inaccuracies and accidental or deliberate damage.

Brilliance of "Scotchlite" Reflective Sheeting doesn't "black out," even in rainy weather. All-weather visibility of shape, color and legend means full-time traffic sign effectiveness.

Moreover, since the need for communication is greater after dark, the need to show all three elements of a traffic sign—shape, color and legend—is also greater. A sign that only shows one of these elements after the sun goes down is only doing 1/3 of its job. A modern sign should show all 3 to work for full-time safety at 100% effectiveness.

Effective communication in all weather is another desirable modern traffic sign performance characteristic. Federal Government specifications (military specification R 13689A) call for sign material that maintains *at least* 75% of dry reflection when subject to rainfall testing. The higher the percentage, the better the sign . . . for again, motorists need the help of traffic signs most when driving conditions are the worst.

The final performance factor is angularity. Typical tests of sign materials at viewing angles of 0°, 10°, 20° and 30° quickly show that a truly effective sign material will retain high reflective quality through any angle of approach. It allows you to put each sign where it ought to be. Wide angularity gives you a measure of compensation for installation inaccuracies and for road curvatures. Also, if a sign is accidentally or deliberately twisted or bent, it will still communicate because wide angle reflectivity keeps the sign message from disappearing.

Durability

This is the first of the economic considerations. You naturally want signs that withstand weathering well enough to fit into your normal sign maintenance cycle. And you want reflectivity to remain high throughout the sign life so that effective communication with the motorist is not interrupted by decreased brightness.

Economy

For economy in effective signing, you want the lowest overall dollar cost consistent with desired performance and durability characteristics. The material that gives you this figure—(formed by dividing length of useful life into the cost of fabrication, installation and maintenance)—will minimize the true cost of communicating with the motorist.

Fabrication

Sign fabrication should be fast, clean and foolproof to insure uniform signing at lowest cost. Highest optical performance depends on a quality controlled sign material not subject to variations in technique or conditions such as humidity and temperature.

The material you choose will also provide more flexibility if it lends itself to both machine and hand application to any kind of backing. For further simplification, it should give you quick, easy refurbishing of old signs, flat or embossed, as well.

These four primary factors and their parts, according to leading engineers, make up the characteristics an effective traffic sign should possess. How do you get all of them at once? We believe there is only one sign material which provides them all: "Scotchlite" Reflective Sheeting. This is the precision all-weather sign material that can give the performance motorists need, with the durability and ease of fabrication and maintenance that you demand.

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TOTAL ENTERING TRAFFIC VOLUMES — LEVERETT CIRCLE, BOSTON, MASS.

Date of Manual Count	11 Hours — 7 A.M. - 6 P.M.	Est. 24 Hours
March 1, 1955	47,466	75,000
July 6, 1955	50,529	81,000
April 3, 1956	53,049	90,000
Construction completed Sept. 1, 1956		
September 26, 1956	55,333	95,000

after a stop condition.

It is acknowledged that Leverett Circle has a finite traffic volume capacity and it is therefore imperative that supplemental highway facilities be developed prior to that future date when the ultimate traffic capacity of Leverett Circle will be exceeded.

Coming Events

February 13-15—NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—
Spring Meeting, Michigan State University, East Lansing, Michigan. Contact: NSPE, 2029 K St. N.W., Washington 6, D.C.

February 24 - 28 — AMERICAN SOCIETY OF CIVIL ENGINEERS—
Convention, Sherman Hotel, Chicago, Ill. Contact: ASCE, 29 W. 39th St., N.Y.C.

March 2-4 — SOUTHERN SAFETY CONFERENCE & EXPOSITION—
Peabody Hotel, Memphis, Tenn. Contact: W. L. Groth, P.O. Box 8927, Richmond 25, Va.

March 17-19 — WESTERN SAFETY CONGRESS & EXHIBITS —
9th Annual Meeting, Ambassador Hotel, Los Angeles, Calif. Contact: Joseph M. Kaplan, 3388 W. 8th Street, Los Angeles 5, Calif.

March 23-29—AMERICAN CONGRESS ON SURVEYING & MAPPING—AMERICAN SOCIETY OF PHOTOGRAMMETRY—
Consecutive Meetings & Exhibit, Shoreham Hotel, Washington, D.C. Contact: ACSM-ASP, 1515 Massachusetts Ave. N.W., Washington 5, D.C.

April 14 - 17 — GREATER NEW YORK SAFETY COUNCIL CONVENTION —
Statler Hotel, New York, N. Y. Contact: Greater N. Y. Safety Council, 60 E. 42nd St., N.Y.C.

May 18-22—AMERICAN SOCIETY OF PLANNING OFFICIALS—
Annual Conference, Hotel Statler, Washington, D.C. Contact: Dennis O'Harrow, ASPO, 1313 E. 60th St., Chicago 37, Ill.

August 17-22 — ILLUMINATING ENGINEERING SOCIETY—
National Technical Conference, Toronto, Ont. Contact: IES, 1860 Broadway, N. Y. 23, N.Y.

September 14-19 — AMERICAN ASSOCIATION OF MOTOR VEHICLE ADMINISTRATORS —
Annual Meeting, Fairmount Hotel, San Francisco, Calif. Contact: AAMVA, 912 Barr Bldg., Washington 6, D.C.

September 16-20 — FOURTH INTERNATIONAL STUDY WEEK IN TRAFFIC ENGINEERING—
Copenhagen, Denmark. Contact: World Touring and Automobile Organization, 32 Chesham Place, London, SW1, England.

September 28 - October 1 — AMERICAN PUBLIC WORKS ASSOCIATION—
Muehlebach Hotel, Kansas City, Mo. Contact: APWA, 1313 E. 60th St., Chicago, Ill.

October 13 - 15 — AMERICAN TRANSIT ASSOCIATION—
Roosevelt Hotel, New Orleans, La. Contact: ATA, 292 Madison Ave., N.Y.C.

October 13 - 17 — AMERICAN SOCIETY OF CIVIL ENGINEERS—
National Convention, Statler Hotel, New York City. Contact: ASCE, 29 W. 39th St., N.Y.C.

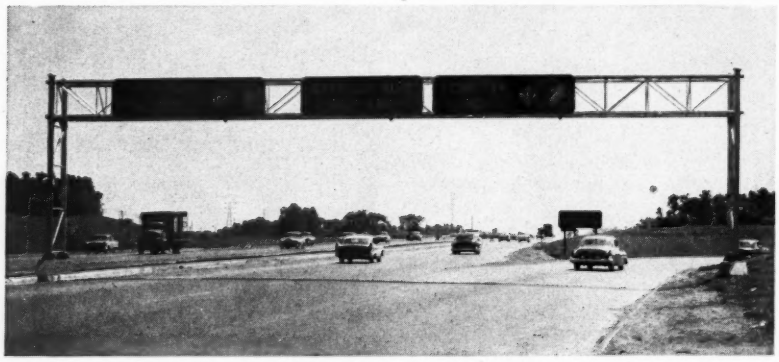
October 20-23 — INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION—
Sheraton Hotel, Philadelphia, Pa. Contact: IMSA, 130 W. 42nd St., N.Y.C.

October 20-24—NATIONAL SAFETY CONGRESS
Conrad Hilton, Congress and other hotels, Chicago, Ill. Contact: NSC, 425 N. Michigan Ave., Chicago 11, Ill.

November 10 - 14 — INSTITUTE OF TRAFFIC ENGINEERS—
28th Annual Meeting, Deauville Hotel, Miami Beach, Florida. Contact: ITE, 2029 K St.,NW, Washington 6, D.C.

November 28-December 5—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS
Annual Meeting, Sheraton-Palace Hotel, San Francisco, Calif. Contact: AASHO, National Press Bldg., Washington 4, D.C.

November 28-December 5—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—
Annual Meeting, Sheraton-Palace Hotel, San Francisco, Calif. Contact: AASHO, National Press Bldg., Washington 4, D.C.



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TOLEDO, OHIO

Position: Assistant Traffic Engineer. To assist Commissioner of Traffic Engineering in Traffic Engineering Division in all activities.
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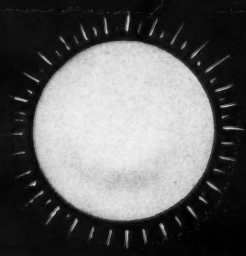

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(Continued from page 27)

Consider how much more effectively a city can conduct such relations when street transportation responsibilities are under a single administrator, than when authority is widely dispersed. This is extremely important at this time.

The new era in highway transportation ushered in by the 1956 Federal Aid Act will make effective working relationships between city and state government a MUST. Recall that more than half the funds provided under the Act will be spent in urban areas. In attempting to develop plans cooperatively with a city where responsibility is divided, the state is hampered at best, and thwarted, at worst. In either case the highway program is retarded. This is a real and present threat to the success of the program. Cities need to face up to this situation and apply corrective measures.

Another thing underlines the need for improved intergovernmental relations and points up the importance of exploring a whole new type of governmental unit. This is the physical growth of cities. Each year an estimated million acres of property is converted to urban use. This growth, however, is not within the jurisdictional boundary of the central city or, in many cases, any city. Thus, the metropolitan area problem of multiple jurisdictions, which once was restricted to New York City, Chicago and a few others, has suddenly appeared to many American cities. This problem is not unique to transportation. It is felt in water supply, sewerage, schools and almost every aspect of governmental activity. To further complicate the situation, many of our metropolitan areas are intercounty and interstate which brings all levels of government — city, county, state and federal — into the picture.

Again, I can suggest no pat solution. The "Metropolitan Government" of Toronto, the "Strong County" of Dade County, Florida, the special "Transportation Authority" of New York City are all attempts to reach a solution. This problem deeply affects our ability to provide adequate highway transportation in urban areas. We must all work toward its solution.

It goes without saying that doing an adequate job requires, in addition to authority, personnel and budget. The budget and manpower required is related to the scope of the assigned responsibility. Certainly the budget for traffic operations, or planning, or any other important function should be established as an independent item under the stewardship of the official responsible for that function. Attempting to carry out the traffic operations responsibility with scraps of funds left over from maintenance or construction is an impossible handicap.

Along the line of budget, I think many traffic engineers are under-estimating the potential benefits they can provide. Consequently they put self-imposed limits on expenditures for adequate traffic control devices. The Boston Central Artery was constructed at the cost of $50 million for the most expensive mile. Therefore, an operational device which would increase the efficiency of that route by one per cent would have a value of $500,000. Not many of us are going to be concerned with the Boston Central Artery. But a parallel situation exists in every community. The cost of adequate traffic control devices is such a small part of the total cost of providing the travelled way that there can be little justification for skimping.

Unfortunately we do not have enough well defined quantity yardsticks against which the level of transportation service can be judged. This is true in all areas of street transportation administration. It is particularly true in traffic operations. We do not know, for example, whether one directional sign per mile provides adequate service or whether we should have four. How much should be spent annually on street markings in a city? How many parking signs are needed? We do not know whether $2 per capita or $5 per capita would be sufficient to provide adequate city traffic control service since standards for the level of service of individual traffic control measures do not exist. Put in its simplest form, we know what to do but not how much. We can not anticipate the structure needed or cost of providing traffic services in the future without these measures.

The NCUT subcommittee writing the administrative manual that I mentioned earlier recognized this deficiency. As a result, the National Committee has asked the Yale Bureau of Highway Traffic to conduct a comprehensive survey of urban transportation administration. The hope is that some of these yardsticks may be developed and in turn translated into manhours and dollars and cents.

Traffic operations is no longer a small or incidental function which can be planned and budgeted on a year to year basis, or as part of another function such as maintenance. We must know how to determine the quantitative need for this service in order to plan wisely and obtain funds to carry it out.

Another study which bears on this same subject is just getting under way. The California Division of Highways, the Institute of Transportation and Traffic Engineering and the Automotive Safety Foundation have undertaken an investigation into the signing needs of urban areas with particular regard to the driver on unfamiliar urban freeways. This study will start, as it must, with the motorist. What is he looking for? What words or guides does he actually understand and follow? Where does he get into trouble and where do the present signing standards fail to meet his needs? Although necessarily limited in scope, we anticipate that much new knowledge on the needs for this specific service will evolve.

We can not be content, however, to look only to the needs for traffic service as we think of them today. The construction of a 41,000-mile system of highways free from intersections, roadside businesses and even advertising signs will inevitably bring new needs for service. The motorists' needs include food, refreshment, rest rooms and an opportunity to stop for a moment, relax, and walk around. In many cases he may need a telephone or detailed directions to his destination. His automobile requires fuel and, not too infrequently, mechanical repairs. These are services to which the motorist has grown accustomed.

The operation of the highway must compensate for isolating him from these services through the mechanism of limited access. We must develop means to communicate with him and direct him to the services he requires.

It seems likely that roadside rest areas complete with telephones, detailed maps and, even, information clerks may be part of the operational features of future roads. Emergency road service and frequent telephones to summon aid must be considered. The New Jersey Turnpike experience indicates a need for emergency roadside

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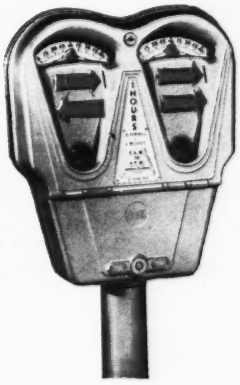

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services every 21,500 vehicle miles. Nor is this exclusively a rural problem. The City of Syracuse has found it necessary to provide roadside telephones on an expressway of less than three miles in length. Retaining walls and right-of-way fences are as effective as rural countryside in blocking communication.

Some of the most severe urban freeway tie-ups can be traced to mechanical breakdown. With the tremendous volumes on these facilities, speed in clearing the traffic lanes is imperative. Closed circuit television or automatic, continuous monitoring of lane speeds and volumes may be required to provide this service.

I mention these points, not as solutions, but as examples of the expanding need for operational services.

Certainly it is inevitable that there will be both *change* and *growth* in the responsibilities of street transportation management. We must allow for these in our basic management structure. When the law assigns broad responsibilities to a single department, the proper assimilation of new duties becomes almost automatic.

So the job for those of us in the field of traffic is to stop doing things the way we have been doing them for 20 years. It is necessary that we look forward rather than back—to concern ourselves with where responsibilities should lie — not where they are presently assigned. This is the present challenge, if we are to be adequately prepared for the problems of tomorrow.

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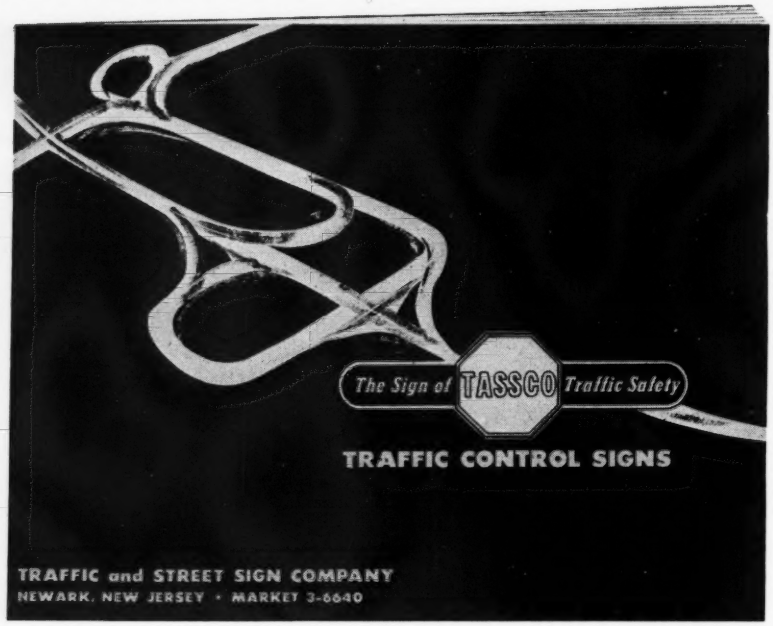
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TRAFFIC NEWS

(Continued from page 32)

Edge-Lining Approved By Ohio Drivers

More than 6200 miles of Ohio's 18,000-mile highway system have been marked with a white edge-line. The program, which was begun last spring, has received considerable public support, according to the Governor and Highway Chief Charles M. Noble. Petitions, newspaper editorials, letters and telephone messages have all praised the edge-lining program as being particularly helpful at night or in fog and on narrow roads with inadequate shoulders.

An analysis of the worth of the edge-lining program will be made by the Department as a two-phase study. First, statistics on accidents occurring in 1956, before edge-lining, will be compared with the 1958 statistics on the same highways, a year after the line was painted. These will be broken down into the types of accidents, where they happened, and weather and road conditions.

The second analysis will compare data on a test strip ten miles long. Five miles were striped and five left unstriped. The Bureau of Public Roads will analyze all the material.

Before this year, edge-lining was experimental in areas with a high night accident rate. In one 8.5 mile test section there were 19 accidents in 1955 before the section was edge-lined. Fifty-eight per cent of the accidents were at night. After edge-lining, the number of accidents dropped to 14—22 per cent of them at night.

Newspaper Recognizes Traffic Engineers' Good Judgment

A recent editorial in the San Francisco *Examiner* pays the traffic engineering profession a welcome compliment. The editorial follows:

Traffic Mistake

The constant traffic jam at Sutter and Stockton Sts. is painful testimony that snap judgments no longer can guide traffic planning.

In the recent extension of the one-way street pattern, Stockton was to have become one-way south from Sutter. This was decided upon after extensive study by traffic engineers of the needs and possible effects.

But just as the new pattern was to go into operation a hotel man pleaded with the Board of Supervisors to keep Stockton two-way in the block from Sutter to Post. The board acceded without first investigating the possible consequences.

Now the heavy volume of southbound traffic emptying out of the Stockton tunnel finds itself stalled at Sutter because the two-way block of Stockton traffic back-up in turn jams Sutter.

There is even reason to suspect that Montgomery St. is adversely affected too because some motorists, aware of the Sutter-Stockton jam, seek to avoid it by shifting all the way east to Montgomery.

The right turn of No. 30 buses from Sutter into Stockton certainly contributes to the mess. There is little Supervisors can do about that without more study. But they can restore the Stockton block to its intended one-way pattern. And they can count to 10 the next time they are tempted to overrule traffic engineers with snap judgments.

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